SHOUT
SHARE
IT

S-NA-P([illegible])

Brigham Young University
Science Bulletin

MUS. COMP. ZOOL.
LIBRARY
FEB 2 1973
HARVARD
UNIVERSITY

NYCTERIBIID BATFLIES FROM VENEZUELA

by

Lindolpho R. Guimarães

NEW WORLD POLYCTENIDAE (HEMIPTERA), WITH SPECIAL REFERENCE TO VENEZUELAN SPECIES

by

Norihiro Ueshima

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 1

SEPTEMBER 1972

BRIGHAM YOUNG UNIVERSITY SCIENCE BULLETIN

BIOLOGICAL SERIES

Editor: Stanley L. Welsh, Department of Botany,
Brigham Young University, Provo, Utah

Members of the Editorial Board:

Vernon J. Tipton, Zoology
Ferron L. Andersen, Zoology
Joseph R. Murdock, Botany
Wilmer W. Tanner, Zoology

Ex officio Members:
A. Lester Allen, Dean, College of Biological and Agricultural Sciences
Ernest L. Olson, Chairman, University Publications

The Brigham Young University Science Bulletin, Biological Series, publishes acceptable papers, particularly large manuscripts, on all phases of biology.

Separate numbers and back volumes can be purchased from Publication Sales, Brigham Young University, Provo, Utah. All remittances should be made payable to Brigham Young University.

Orders and materials for library exchange should be directed to the Division of Gifts and Exchange, Brigham Young University Library, Provo, Utah 84601.

Brigham Young University
Science Bulletin

NYCTERIBIID BATFLIES FROM VENEZUELA

by

Lindolpho R. Guimarães

NEW WORLD POLYCTENIDAE (HEMIPTERA), WITH SPECIAL REFERENCE TO VENEZUELAN SPECIES

by

Norihiro Ueshima

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 1

SEPTEMBER 1972

TABLE OF CONTENTS

VENEZUELAN NYCTERIBIID BATFLIES (Diptera: Nyteribiidae)

INTRODUCTION ... 1

BASILIA SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTIONS ... 1
- *Basilia anomala* Guimarães and D'Andretta ... 1
- *Basilia wenzeli* Guimarães and D'Andretta ... 2
- *Basilia tiptoni* Guimarães ... 2
- *Basilia bequaerti* Guimarães and D'Andretta ... 2
- *Basilia ortizi* Machado-Allison ... 2
- *Basilia juquiensis* Guimarães ... 3
- *Basilia dubia* Guimarães and D'Andretta ... 3
- *Basilia constricta* Guimarães and D'Andretta ... 4
- *Basilia tuttlei,* new species ... 4
- *Basilia typhlops,* new species ... 5
- *Basilia ferrisi* Shuurmans-Stekhoven ... 7
- Key to Females of Venezuelan Species of *Basilia* ... 8

HOST RELATIONSHIPS AND DISTRIBUTION ... 8

LITERATURE CITED ... 10

NEW WORLD POLYCTENIDAE (Hemiptera), WITH SPECIAL REFERENCE TO VENEZUELAN SPECIES

INTRODUCTION ... 13

HESPEROCTENES SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTION ... 13
- *Hesperoctenes longiceps* (Waterhouse) ... 13
- *Hesperoctenes hermsi* Ferris and Usinger ... 16
- *Hesperoctenes cartus* Jordan ... 16
- *Hesperoctenes setosus* Jordan ... 16
- *Hesperoctenes fumarius* (Westwood) ... 16
- *Hesperoctenes angustatus* Ferris and Usinger ... 17

HOST RELATIONSHIPS AND DISTRIBUTION ... 17
- Key to the Species of *Hesperoctenes* ... 19

LITERATURE CITED ... 20

This publication is a contribution of the Smithsonian Venezuelan Project, supported by a contract (DA-49-193-MD-2788) of the Medical Research and Development Command, Office of the Surgeon General, U. S. Army.

VENEZUELAN NYCTERIBIID BATFLIES (Diptera: Nycteribiidae)

Lindolpho R. Guimarães[1]

ABSTRACT

Eleven species of Nycteribiidae, all belonging to the genus *Basilia*, are reported from Venezuela. Of these, two (*tuttlei* and *typhlops*) are described as new and four (*anomala*, *dubia*, *juquiensis*, and *tiptoni*) are recorded for the first time. *B. anomala* is the first species with three tergal plates to be found in South America. Synonymies, previous localities, and host records are given for all species, as well as new records and comments. Geographical distribution and host-parasite associations are discussed. Field parties of the Smithsonian Venezuelan Project obtained the material on which this paper is based.

INTRODUCTION

Guimarães and D'Andretta (1956) recorded only four species of nycteribiids from Venezuela, all belonging to the genus *Basilia*: *B. myotis* Curran, 1955; *B. wenzeli* Guimarães and D'Andretta, 1956; *B. constricta* Guimarães and D'Andretta, 1956; and *B. bequaerti* Guimarães and D'Andretta, 1956.

B. myotis, now considered to be a synonym of *Basilia ferrisi* Schuurmans-Stekhoven, 1931 (see Peterson, 1971), had already been recorded, under the name *B. bellardii* (Rondani, 1878), from Aragua by Hase (1931); from Anzoategui by Schuurmans-Stekhoven (1931); from Miranda (as *B. myotis*), from Bolivar; and Amazonas by Bequaert (1942). Guimarães and D'Andretta (1956) found it in Aragua and Zulia. Other species found by Guimarães and D'Andretta (1956) were *B. bequaerti*, from the Rio Orinoco (once); *B. wenzeli*, from Aragua (three times); and *B. constricta*, from Zulia (once). In 1963 Machado-Allison described a fifth species, *B. ortizi*, from Bolivar. Teams of the Smithsonian Venezuelan Project collected *B. ferrisi*, *B. wenzeli*, and *B. ortizi*, plus *B. anomala* Guimarães and D'Andretta, *B. dubia* Guimarães and D'Andretta, *B. juquiensis* Guimarães, and *B. tiptoni* Guimarães, and two new species described herein. They did not find *B. bequaerti* or *B. constricta*.

This paper is based on collections made by personnel of the Smithsonian Venezuelan Project (SVP), which was directed by Dr. Charles O. Handley, Jr., U. S. National Museum of Natural History and Dr. Vernon J. Tipton, Brigham Young University.

The specimens were sent to me by Drs. C. Machado-Allison, Vernon J. Tipton, and Rupert L. Wenzel, to whom I am very grateful. Thanks are due Dr. Charles O. Handley, Jr., for the names of hosts and for the lists of vertebrates collected in Venezuela by personnel of the Smithsonian Venezuelan Project.

BASILIA SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTIONS

Basilia anomala Guimarães and D'Andretta

Basilia anomala Guimarães and D'Andretta, 1956:67, Fig. 83, 95a, 100.– Maa, 1965:380.– Theodor, 1967:258.

PREVIOUS RECORDS AND HOSTS

Mexico: Chiapas, Huehuetan, ex *Rhogeëssa tumida*. Guatemala: Solalá, Moca, ex *Rhogeëssa tumida*.

VENEZUELAN RECORDS

One female and a male ex *Rhogeëssa tumida* (SVP 5060). Falcon, 19 km NW Urama, 27-X-1965.

REMARKS

This represents the first collection of a

---

[1] Museu de Zoologia, Universidade de Sao Paulo, Sao Paulo, Brazil

species with three apparent tergites in South America. The southernmost locality of this species was Solalál, Guatemala (however, some time ago I identified a female belonging to the Field Museum in Chicago, ex *Myotis nigricans*, from Matagalpa, Nicaragua). Tergite III of this species is actually represented by a fold of the connexivum, anterior to the anal segment, and fringed by some setae of various lengths. With the exception of the Nicaraguan specimen (ex *Myotis nigricans*), the species has been recorded only from *Rhogeëssa tumida*.

Basilia wenzeli Guimarães and D'Andretta

Basilia wenzeli Guimarães and D'Andretta, 1956:42, Fig. 25-33, 57-80.– Maa, 1965: 381. – Guimarães, 1966:396. – 1968:101.3.– Theodor, 1967:270, Fig. 419, 467, 468.

Previous Records and Hosts

Venezuela: Aragua, Rancho Grande, ex *Eptesicus fuscus* and *Lonchorhina aurita*. Colombia: Cundinamarca, Bogotá (Boquerón, San Francisco, 3000 m elev.), ex *Histiotus* sp. (=*H. montanus*). Panama: Bocas del Toro, Sibube; Los Santos Province; San Blas, Armila, all from *Eptesicus furinalis gaumeri;* Los Santos, Cerro Hoya, ex *Artibeus j. jamaicensis*.

Venezuelan Records

Nineteen females and 10 males ex *Eptesicus montosus* (SVP 9, 40, 45, 46, 47, 49, 51, 55, 167, 193, 213, 423, 427, 431, 436, 438, 439, 488), D. F., 4 km NNW Caracas, 1400-1581 m elev. 21-VII to 2-VIII-1965.

Remarks

The female of *B. wenzeli* is one of the most characteristic of South American species of the genus *Basilia* because of the length of the terminal segment and because the anal segment is located far forward. This species belongs to the group in which the posterior margin of tergal plate II of the female shows two long processes and the median elevation of the mesonotum is very conspicuous.

Basilia tiptoni Guimarães

Basilia tiptoni Guimarães, 1966:396, Fig. 36.– 1968:101.3.

Previous Records and Hosts

Panamá: Bocas del Toro, 22 miles south of Changuinola, ex *Lonchorhina aurita* or *Tonatia minuta* and ex "like *Tonatia*"; Bocas del Toro, Sibube, ex *Mimon crenulatum keenani*.

Venezuelan Records

Twenty-eight females and 16 males ex *Mimon crenulatum* (SVP 1672, 1746, 1781, 1794, 1796, 1815, 1818, 1819, 1964, 1965, 1966, 1967, 1968, 1981, 1984, 1986, 5015, 5065, 5067, 5297), Falcon, 19 km NW Urama (at road junction known as "Km 40"), 5-25 m elev., 18-X to 16-XI-1965; 1 female and 1 male ex *Mimon crenulatum* (SVP 2933), Trujillo, 22 km N Valera near Aqua Viva, 164 m elev., 18-IX-1965; 1 female ex *Mimon crenulatum* (SVP 5654), Apure, 46 km NE Puerto Paez near Hato Cariben, Río Cinaruco, 76 m elev., 14-XII-1965.

Remarks

According to Theodor and Peterson (1964), *B. tiptoni* is closely related to *B. mimoni*. Doubtless the two species are associated with the same species of bat, *Mimon crenulatum*, as their normal host. However, *B. tiptoni* has also been found on *Lonchorhina* sp. and *Tonatia* sp. *B. mimoni* has heretofore been known only from Loreto, Peru, but through the kindness of Dr. R. Wenzel I have had the opportunity of examining 2 males and 1 female from Belém, Pará, Brazil, also collected on *Mimon crenulatum*. The specimens of *tiptoni* here studied (17 males and 30 females) were collected on 22 specimens of *Mimon crenulatum* from western Venezuela. Besides the differences noticed by Theodor and Peterson (it is curious that *mimoni* was described in 1964 and *tiptoni* in 1966), the female of *tiptoni* has a group of setae on either side of the base of the anal segment and laterally a row of setae of median length. The number of long setae on each process of tergal plate II of *B. tiptoni* varies from 2-4; in *B. mimoni* there are only 2. The specimens from Venezuela also have only 2 setae.

Basilia bequaerti Guimarães and D'Andretta

Basilia bequaerti Guimarães and D'Andretta, 1956:37, Fig. 18-24, 56, 77.–Maa, 1965:381.– 1967:370. – 1965:381. – Guimarães, 1968: 101.3.–Peterson, 1971:5.

Previous Records and Hosts

Paraguay: Sapucay, ex *Histiolus dorianus* (*Eptesicus dorianus*). Colombia: Espinal, ex *Micronycteris megalotis*. Venezuela: Río Orinoco, unidentified host.

Remarks

No positively identifiable specimens of *bequaerti* were found among the collections of the Smithsonian Venezuelan Project. The species is very close to *Basilia ortizi* and will be discussed under the latter.

Basilia ortizi Machado-Allison

Basilia ortizi Machado-Allison, 1963, Fig. 1-6.– 1967:370. – Maa, 1965:381. – 1967:370. – Guimarães, 1968:101.3.–Peterson, 1971:5.

Previous Records and Hosts

Venezuela: Bolivar, Serrania de Nurie, ex *Eptesicus melanopterus* (=*E. brasiliensis melanopterus*). Costa Rica: Puntarenas, Boca de Barranca, ex *Eptesicus gaumeri* (=*E. furinalis gaumeri*).

Venezuelan Records

One female ex *Artibeus harti* (SVP 41), D. F., 4 km NNW Caracas, 1465 m elev., 22-VII-1965; 4 females and 1 male ex *Eptesicus brasiliensis* (SVP 6632), Amazonas, 84 km SSE Esmeralda, Boca Mavaca, Rio Orinoco, 185 m elev., 13-II-1966; 2 females ex *Eptesicus furinalis* (SVP 12617), Bolivar, 146 km S and 7 km E Ciudad Bolivar, Hato San Jose, 298 m elev., 6-IV-1967; 1 female ex *Eptesicus furinalis* (SVP 15057), Monagas, 55 km SE Maturin, Hato Santa Barbara, 36 m elev., 8-VIII-1966; 1 female ex *Eptesicus furinalis* (SVP 18213), Amazonas, Tamatama, Río Orinoco, 135 m elev., 26-IV-1967; 4 females and 1 male ex *Eptesicus brasiliensis* (SVP 18324, 18345, 18347), same locality, 28-IV-1967; 2 females ex same host (SVP 18348, 18350), same locality, 28-IV-1967; 1 male ex *Myotis riparius* (SVP 19562), Amazonas, Casiquiare Canal, Capibara, 130 m elev., 8-VI-1967; 1 female ex *Eptesicus brasiliensis* (SVP 26833), Amazonas, above Maracay, W side Río Manapiare, 155 m elev., 17-VII-1967; 5 females ex *Eptesicus brasiliensis* (SVP 27951), Amazonas, W side Río Manapiare, near San Juan, 155 m elev., 20-VII-1967.

Remarks

Without doubt, *Basilia ortizi* is very close to, if not the same as, *Basilia bequaerti*. The type materials of *B. ortizi*, which I have seen through the kindness of Dr. Machado-Allison, are mounted on a slide, and the pressure of the cover slip has so distorted the specimens that it is very difficult to study them under the microscope. Examining the type specimens under the entomological scope, and so with relatively small magnification, it seems that the only differences are in the pustulate setae of the lateral connexivum—less numerous and less uniform in length in *B. ortizi*—and in the shape of the posterior elevation of the mesonotum. Other characters, such as shape and number of setae of the posterior process of tergal plate II and shape of the anal segment, are within the limits of variability of *B. bequaerti*. All Venezuelan specimens I have examined have 2 long setae on the posterior lobes of tergal plate II, as does *Basilia mimoni* (sometimes one of those setae is of median length). However, Paragnayan and Peruvian specimens have 2-4 such setae.

Basilia juquiensis Guimarães

Basilia juquiensis Guimarães, 1946:73, Fig. 89-93.— Guimarães and D'Andretta, 1956:112, Fig. 180, 186, 187.— Maa, 1965:380 (as subgenus *Pseudelytromyia*).— Machado-Allison, 1967:370.—Guimarães, 1968:101.3.

Basilia juquiensis juquiensis, Theodor, 1967:279, Fig. 477, 478.

Previous Records and Hosts

Brazil: São Paulo, Juquiá, ex *Myotis n. nigricans*.

Venezuelan Records

Two females ex *Myotis riparius* (SVP 40267), Apure, 3 km NE Nula, La Chiricoa, 30-I-1968; 1 female ex same host (SVP 40454), same locality, 31-I-1968.

Remarks

This species is a true puzzle. The only difference between *B. juquiensis* and *B. anceps* is the length of the pustulate setae of the lateral connexivum of the abdomen (shorter in *anceps* behind the IV spiracle). When Guimarães and D'Andretta (1956) described *B. anceps*, they suggested it could be no more than a subspecies of *juquiensis*. Theodor (1967) so considered it. The Venezuelan specimens are morphologically similar to *juquiensis*, and I have no alternative than to identify them as such. However, the geographical distribution of the two species becomes rather difficult to understand. *B. anceps* has been recorded from Colombia (Caquetá), Peru (Huanuco), and Panamá (Los Santos and San Blas) on *Myotis nigricans*. *B. juquiensis* is known only from southern São Paulo, Brazil, also on *Myotis nigricans*, and now from Apure, southwestern Venezuela, on the same host species and on *Myotis riparius*.

Basilia dubia Guimarães and D'Andretta

Basilia dubia Guimarães and D'Andretta, 1956: 102, Fig. 150, 154, 160, 167, 168, 177.— Maa, 1965:380 (as subgenus *Pseudelytromyia*).— Machado-Allison, 1967:370.— Theodor, 1967: 276; Fig. 423.— Guimarães, 1968:101.2.

Previous Records and Hosts

Brazil: Mato Grosso, Chavantina, ex *Myotis n. nigricans*; Amazonas, Manaus, ex *Myotis n. nigricans*. Peru: Cuzco, Marcapata Hda. Cadena, ex *Myotis albescens*.

Venezuelan Records

One female ex *Myotis albescens* (SVP 6456), Apure, 38 km NNW Puerto Paez, Río Cinaruco, 76 m elev., 25-I-1966; 1 male, same data (SVP 6459); 1 female ex *Myotis albescens* (host not cataloged), Amazonas 84 km SSE Esmeralda, SW Río Mavaca, Río Orinoco, 138 m elev., 3-III-1967; 1 female and 2 males ex *Myotis albescens* (SVP 17444), Amazonas, 108 km SSE Esmeralda, W side of Río Mavaca, 140 m elev., 3-IV-1967; 1 female ex *Saccopteryx bilineata* (SVP 34393), Apure, 3 km N Nula, Nulita, 24 m elev., 17-

I-1968; 3 females and 2 males ex *Myotis albescens* (SVP 34395, 34397), same locality and date.

REMARKS

Basilia dubia is very close to *Basilia carteri;* in the female the chief differences are a rather cordiform tergal plate I, a small number of pustulate setae on the lateral connexivum, and a larger number of setae on the anal segment. In the specimens under consideration, tergal plate I is not so cordiform as in the specimens previously known, and one specimen (from Apure, SVP 6456) has no pustulate setae on the lateral connexivum. Even so, I prefer, at least provisionally, to consider all specimens as *B. dubia.*

Basilia constricta Guimarães and D'Andretta

Basilia constricta Guimarães and D'Andretta, 1956:80, Fig. 82, 112-117, 123, 130, 131, 148.– Maa, 1965:380 (as subgenus *Pseudelytromyia.*– Machado-Allison, 1967:370.– Theodor, 1967:273, Fig. 426, 438, 472.– Guimarães, 1968:101.2.

PREVIOUS RECORDS AND HOSTS

Ecuador: Gualaquiza, ex *Myotis nigricans;* Oriente, Macas, ex *Myotis albescens* and ex *Tonatia amblyotis* (=*T. silvicola*). Peru: Huanuco, ex *Myotis n. nigricans* and ex *Uroderma bilobatum.*– Tingo Maria, Rio Huallaga, ex *Myotis n. nigricans.* Colombia: Catival, ex *Eptesicus brasiliensis.* Venezuela: Zulia, Lagunillas, ex *Macrophyllum macrophyllum;* Mérida, unidentified host.

REMARKS

This species is not represented in this collection. Guimarães and D'Andretta (1956) recorded only two females from Venezuela, one from Zulia, Lagunillas, ex *Macrophyllum macrophyllum* and one from Mérida, from an unidentified host. This species has the characteristic lateral constriction in the abdomen of the female. It belongs to group III of Guimarães and D'Andretta (1956) and to the *B. speiseri* group of Theodor (1967).

Basilia tuttlei, new species

(Fig. 1)

This species belongs to the *speiseri* group; that is, the posterior margin of tergal plate II is straight or arcuate and the sixth sternite is longitudinally divided on the midline. It is a very characteristic species, identifiable by numerous setae on either side of the anal segment and between this segment and tergal plate II seven or eight transverse rows of setae with a bare space in the middle and by the presence of four transverse rows of setae on the anterior margin of the distal half of the tibiae.

DESCRIPTION

FEMALE: Length 2.26 mm (from the anterior margin of the vertex to the posterior end of the abdomen).

Head. Vertex with two pairs of setae between eyes and anterior margin; pair of shorter setae between eyes. Anterior margin of each gena with 6 or 7 setae scattered on either side of postgena. Each palpus with two pairs of setae near lateral margins; 5 others at apex, 1 of which is much longer than others. Eyes typically two-facetted and pigmented. *Thorax.* Wider than long (1.20 x 0.78 mm). Anterior margin only slightly curved. Thoracic ctenidium with 20-22 spines. Mesonotum raised posteriorly but without median digitiform process; notopleural suture with 9 setae. Tibiae with four transverse rows of setae on distal half of ventral edge. *Abdomen.* First tergite (first tergal plate or first visible tergite) funnel shaped, wider than long;

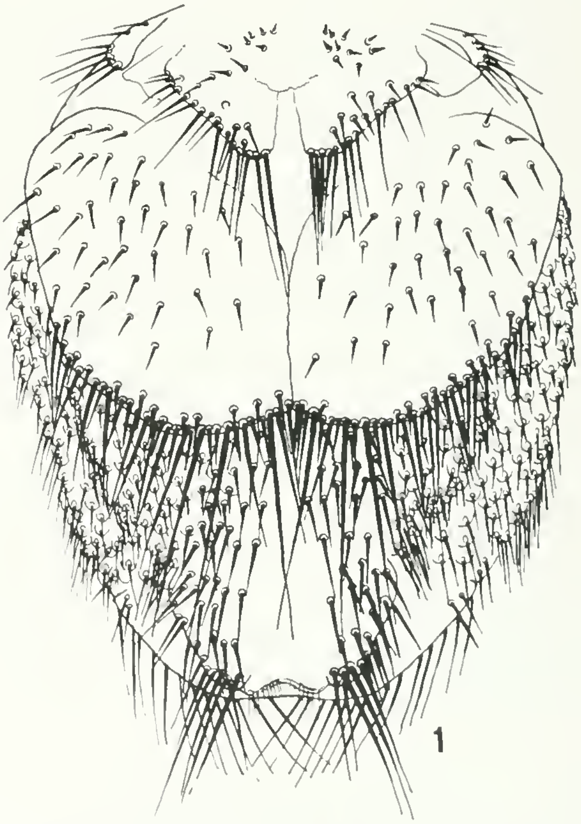


Fig. 1 *Basilia tuttlei,* new species, abdomen of female (dorsal)

its margins with several setae of median length and several shorter medial setae. Setae of posterior margin distributed asymmetrically, more closely set on one side of tergite; posterior margin interrupted at middle to form a rather large bare space between two groups of setae; few discal short setae scattered irregularly. Tergal plate II with lateral and posterior margins arcuate, at least partially fringed by setae of medium to long length, irregularly interspersed with short, strong ones; posterior margin shows clear notch at level of median suture; discal setae uniformly distributed, except along midline and on back where they lack uniform distribution. Median suture at least partially evident. Anal segment with lateral margins slightly convergent posterad; on its posterolateral angles or near them 3 or 4 long setae and 1 or 2 median length setae on either side. On either side of anal segment and between this segment and tergal plate II, 7 or 8 transverse rows of setae; midline from tergal plate II to posterior margin of anal segment bare. Lateral connexivum with pustulate setae of varied length. Sternite I + II 0.570 mm long (including spines of ctenidium); ctenidium of posterior margin of sternite with about 74 to 76 pointed spines; sternites III and IV delimited, each one by row of setae longer than discal ones and still longer on sides; disc of sternite III with 3 longer setae on either side of midline. Sternites V and VI represented by two plates longitudinally separated on midline; each plate of tergite V with row of setae on posterior margin and another, of 5 or 6 shorter setae, anterad; each plate of sternite VI with 3 rows of setae; setae located near midline longer and stronger than others. Terminal segment with several setae of medium length forming irregular rows; setae of posterior margin stronger and longer than discal ones. Adanal plates roughly quadrangular with 3 and 4 setae on distal end. Anal sclerite small, with 2 setae irregularly disposed, linked to genital plate by clearly sclerotized strip. Genital plate with 3 setae. Tegument sculptured between adanal plates and genital plate, with numerous very small spine-like structures, more conspicuous near the genital plate.

Type Data: Male unknown. Female holotype ex *Myotis nigricans* (SVP 16216), Amazonas, Rio Cunucunuma, Belén (Mouth of Caño Culebra) 150 m elev., 2-II-1967, M. D. Tuttle and F. L. Harder collectors, deposited in the collection of the U.S. National Museum, Washington, D.C.

This species is named in honor of M. D. Tuttle, who collected many of the nycteribiids studied in this paper.

Basilia typhlops, new species

(Fig. 2)

With *B. tuttlei*, new species, this species belongs in the *speiseri* group of species which is characterized by two tergal plates, tergal plate II with posterior margin straight or arcuate, the sixth (considering the first visible sternite as I + II) sternite longitudinally divided. Among the species of this group, *B. typhlops* closely resembles *B. dunni*, from which it differs by several characters: tergite I is shorter (in Fig. 2 it appears still much foreshortened, owing to its curvature) and shows fewer discal setae; tergite II is narrower, its posterior margin straighter, and its discal setae have a different distribution (see below). The anal segment, in spite of having a rather similar shape, is much more pilose, and among the pustulate setae of

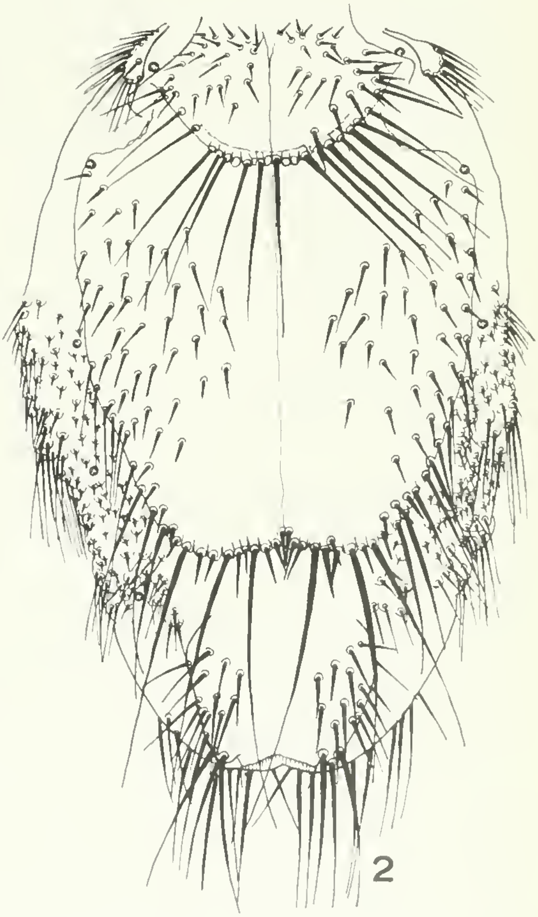


Fig. 2 *Basilia typhlops*, new species, abdomen of female (dorsal)

the lateral connexivum some are very long contrasting with the length of the other setae, while they are of uniform length in *B. dunni*. Sternite III in *B. dunni* is perfectly outlined by a row of setae, but in *B. typhlops* there is no row of setae separating sternites III and IV.

Description

Female: Length 2.40 mm (from anterior margin of vertex to posterior extremity of abdomen). *Head.* Anterior margin of vertex with two pairs of setae; another pair further back at level of eyes. Anterior margin of each gena with 6 or 7 setae, posterior one largest; 6 or 7 scattered short setae on either side of postgena. Each palpus with 7 or 8 setae near sides and apical one much longer than others. Eyes absent. *Thorax.* Wider than long (1.07 x 0.75 mm). Thoracic ctenidium with 19-20 spines. Mesonotum slightly raised posteriorly but without median digitiform process; notopleural suture with 9 setae. Tibia normal, with three rows of setae on distal half of ventral edge. *Abdomen.* First tergite (first tergal plate, tergal plate I, or first visible tergite) half as long as tergal plate II (due to curvature of abdomen this plate appears foreshortened in Fig. 2); its margins rounded, with parallel strip, fringed by 20-26 setae that become shorter anteriorly; discal setae irregularly scattered, midline and posterior part of tergite bare; median suture rather evident. Tergal plate II with lateral margins slightly rounded, posterior margin nearly straight; posterior half of lateral margins fringed with setae of median length, increasing posteriorly; posterior margin also fringed with 6 or 7 long, strong setae interspersed with 1 or 2 much shorter but also strong setae (spinelike setae); discal setae more numerous on sides of tergite, fewer toward midline, outlining a rough triangle, pointing toward midline but not reaching suture; the latter rather evident. Anal segment with lateral margins converging backward, with several setae on either side; on lateroposterior angle 3 or 4 setae, longer and stronger than discal ones. Lateral connexivum covered with pustulate setae of varied length but chiefly small; longer setae of region contrast sharply with smaller ones. Sternite I + II 0.570 mm long (including spines of ctenidium); ctenidium of posterior margin with 59 to 64 pointed spines; base of sternite bare, discal setae not very numerous and increase moderately in size posteriorly. Sternites III and IV without clear delimitation since there is only one regular row among numerous setae between sternite I + II and sternite V; other setae of region increase in length toward posterior row. Sternites V and VI better sclerotized and divided on midline, each one thus with two lateral sclerites; each plate of sternite V with two rows of setae: posterior one, near the margin, with at least 10 setae; anterior one with 3 or 4 setae irregularly distributed. Each sclerite of sternite VI with three rows of setae, two anterior ones with fewer and irregularly distributed setae; posterior row forms fringe on posterior margin of sternite. On lateral sides of tergites V and VI setae appear to be arranged in indistinct rows. Terminal sternite not as long as wide, with several discal and lateral setae on posterior two-thirds. Adanal plate triangular, with 3 setae on distal end. Anal sclerite small, with 2 setae, apparently linked to genital plate by a strip slightly better sclerotized than tegument. Genital plate with 6 setae. Between adanal plates and genital plate tegument is sculptured with numerous very small spinelike structures.

Type Data: Male unknown. Female holotype ex *Myotis oxyotus* (SVP 8191), Bolivar, 85 km SSE El Dorado at km 125, 826 m elev., 16-V-1966, M. D. Tuttle and A. L. Tuttle collectors, deposited in the collection of the U.S. National Museum, Washington, D.C. One paratype female ex *Myotis oxyotus* (SVP 42998), Bolivar, 43.2 km NE Icabarú, El Mundo Nuevo de Surukum; 851 m elev., 3-V-1968, A. L. Tuttle collector.

Remarks

This is the first eyeless species of *Basilia* from the New World. Although one of the specimens shows, under greater enlargement (8 x 25 x 1.6), the tegument a little lighter in the ocular region, it is without any doubt completely blind. The absence of eyes is, according to Theodor (1967), the only character that separates the subgenus *Tripselia* from *Basilia* s. str. Three species of the subgenus *Tripselia* occur in continental Africa, Mauritius, and Madagascar; 6 or 7 species occur in the Oriental region (India, Ceylon, Borneo, and Sumatra) and 10 species occur in Australia and New Guinea. They form a rather homogeneous group, with tergal plate II similar to that of the *bathybothyra* group of the subgenus *Basilia* and with at least three tergal plates, a character of every species of the subgenus *Basilia* in the Old World and of 5 American species. *B. typhlops* new species belongs to the *speiseri* group and, as in the majority of the South American species, has only two tergal plates (*B. anomala*, a species with three tergal plates, is being reported for the first time from South America in this paper). The absence of eyes and the geographic distribution of the subgenus *Tripselia* may indicate an evolutionary lineage originating from the *bathybothyra* group, which belongs to the subgenus *Basilia* and accordingly has eyes. On the other hand, the absence of eyes in a South American species typically belonging to the *speiseri* group is certainly due to parallel evolution. So, it would not be justifiable, solely on the ground of eyelessness, either to place the new species in the subgenus *Tripselia* or to sink this subgenus in *Basilia* s. str. Distributed over all zoogeographic regions of the world, the genus *Basilia* has more than 80 species, is consequently very heterogeneous (chiefly the females), and needs a very careful revision. Until this is done I prefer to place *typhlops*, new species, in the group *speiseri* of the subgenus *Basilia*.

Basilia ferrisi Schuurmans-Stekhoven

Basilia speiseri Ferris, 1924:198, Pl. III (nec M. Ribeiro, 1907).—Stiles and Nolan, 1931:648 (part).— Curran, 1935:4 (part).

Basilia ferrisi Schuurmans-Stekhoven, 1931:217.—Scott, 1936:502. – 1939:168.—1940:61. – Guimarães, 1940:5. – 1946:16, 19. – 1968:101.2—Guimarães and D'Andretta, 1956:75.—Maa, 1965:380 (as subgenus *Pseudelytromyia*).—Theodor, 1967:278.—1968:101.2. – Peterson, 1971:3.

Basilia bellardii Schuurmans-Stekhoven, 1931: 207, Fig. 1-6 (nec Rondani, 1878).— Hase, 1931:220, Fig. 1-17; Scott, 1936:497 (part).—Bequaert, 1942:83.— Guimarães, 1946:62 (part).— Karaman, 1948:42, Fig 4.

Basilia myotis Curran, 1935:3, Fig. 3-5.— Scott, 1936:497.— Bequaert, 1942:84.— Del Ponte, 1944:124.—Guimarães, 1946:16, 19. – 1966: 398.—1968:101.3.—Guimarães and D'Andretta, 1956:76, Fig. 85, 106-111, 124, 129, 145.—Peterson, 1960:34.—Maa, 1965:380 (as subgenus *Pseudelytromyia*). – Machado-Allison, 1967:370.

Guimarãesia bellardii, Schuurmans - Stekhoven, 1931:112.

PREVIOUS RECORDS AND HOSTS

Costa Rica: Sipurio, ex *Myotis nigricans;* Alajuela, Playavelas (?), ex *Myotis* sp. Guatemala: Finca San Victor, ex *Myotis nigricans* and *Molossus* sp. (*bondae?*). Panamá: Tapia, ex *Myotis nigricans;* Darien, Camoganti, ex *Myotis nigricans;* Canal Zone, Gamboa, Fort Davis and Barro Colorado Island, ex *Myotis n. nigricans.* Colombia: Antioquia, ex *Myotis nigricans;* Santander, ex *Myotis nigricans;* Meta, Villavicencio, ex *Myotis nigricans;* Chocó, Andagoya, unidentified host; Bolivar, Socorré, ex *Myotis nigricans,* Catival, ex *Myotis nigricans,* Colosso, ex *Uroderma bilobatum.* Peru: Loreto, Pucallpa, unidentified host. Venezuela: Anzoategui, Puerto la Cruz, ex *Myotis* sp.; Bolivar, Surukun, ex *Myotis nigricans;* Amazonas, Río Casiquiare, unidentified host; Miranda, Petare, "El Encantado," unidentified host; Aragua, Ocumare de la Costa, ex *Myotis* sp.; Rancho Grande, ex *Myotis* sp.; Zulia, Lagunillas, ex *Myotis n. nigricans, Dasypterus* sp., (=*Lasiurus ega*), and *Molossus crassicaudatus.* Guyana: Demerara, Buxton, ex *Myotis n. nigricans.*

VENEZUELAN RECORDS

One female and 1 male ex *Myotis nigricans* (SVP 13904, 13907), Monagas, 2 km N and 2 km W Caripe, Hda. San Fernando, 1190 m elev., 4-VII-1967; one female, ex *Myotis albescens* (SVP 13934), same locality, 5-VII-1967; one female ex *Desmodus rotundus* (SVP 14276), Monagas, 2 km S and 2 km W Caripe, Hda. Tucuseto, 854 m elev., 13-VII-1967; one female and one male ex *Myotis nigricans* (SVP 31356), Amazonas, 25 km SSE Puerto Ayacucho, Paria, 114 m elev., 4-X-1967; one female and one male ex *Myotis riparis* (SVP 34405), Apure, 3 km N Nula, Nulita, 24 m elev., 17-1-1968.

REMARKS

Recently, upon comparing the syntypes of *Basilia ferrisi* (identified in 1924 by Ferris as *B. speiseri* and independently named *ferrisi* by Schuurmans-Stekhoven in 1931 and by Scott in 1936) with the type of *Basilia myotis,* Peterson (1971) confirmed the supposition of Guimarães and D'Andretta (1956:76) that the two are actually the same species.

The specimens from Amazonas and Apure are typical *ferrisi,* but those from Monagas (only females) show a longer first visible tergite (tergal plate 1) and fewer pustulate setae on the lateral connexivum. In spite of these differences, I prefer to call all present specimens *ferrisi* until better materials are available.

Specific determination is not possible for 6 male specimens (representing five collections). Two males, ex *Mimon crenulatum* (SVP 42690), Zulia, 48 km WNW Encontrados, El Rosario, 54 m elev., 1-IV-1968; 1 male ex *Myotis riparius* (SVP 7613), Bolivar, 50 km SE El Manteco, Río Supamo, 150 m elev., 7-IV-1966; 1 male ex *Myotis riparius* (SVP 40269), Apure, 3 km NE Nula, La Chiroca; 1 male, ex *Mimon crenulatum* (SVP 34596), Apure, 3 km N Nula (San Camilo), Nulita, 24 m elev., 22-I-1968; 1 male, ex *Myotis nigricans* (SVP 34835), Apure, 3 km N Nula (San Camilo), Nulita, 24 m elev., 24-I-1968.

Key to Females of Venezuelan Species of *Basilia*[2]

1\. Two tergal plates on abdomen anterad of anal segment ... 2
Three tergal plates on abdomen anterad of anal segment; third plate appears to be only a fold of segment, fringed by row of setae ... *anomala*

2\. Tergal plate II (second visible tergite or tergite II) produced posterad into two lobes; lateral margins of same tergite at least shallowly curved inward at caudal third ... 3
Tergal plate II with rounded or straight posterior margin ... 6

3\. Posterior process of tergal plate II very narrow; terminal segment long, reaching far beyond anal segment ... *wenzeli*
Not as above ... 4

4\. Tergal plate I (first visible tergite or tergite I) moderately produced in middle and with 2-4 setae on process; several setae on base of anal segment; area of pustulate setae of lateral connexivum ending behind, on each side, in row of setae ... *tiptoni*
Tergal plate I not produced in middle, fringed with several setae ... 5

5\. Pustulate setae of lateral connexivum very short and of uniform length ... *bequaerti*
Pustulate setae of lateral connexivum short but not uniform in length ... *ortizi*

6\. Each plate forming tergal plate II more than twice as long as wide; this tergite with group of setae on anterior lateral corners and another in middle ... *juquiensis*
Tergal plate II not as above ... 7

7\. Lateral connexivum bare posteriorly or with small group of very short pustulate setae in middle of bare region ... *dubia*
Lateral connexivum not as above ... 8

8\. Each plate of tergal plate II twice as wide as long; constriction at middle of abdomen ... *constricta*
Each plate of tergal plate II longer than wide, but no more than twice so; no abdominal constriction ... 9

9\. Tibiae of all legs with four transverse rows of setae on ventral margin; seven to eight rows of a few setae each on anal segment and between it and tergal plate II ... *tuttlei*, new species
Not as above ... 10

10\. Discal setae of tergal plate II forming on each side an angle pointing toward midline of tergite; longer setae of posterior margin of tergal plate I not reaching posterior margin of tergal plate II ... *typhlops*, new species
Tergal plate II with few discal setae distributed mainly on sides; longer setae of posterior margin of tergal plate I reaching to or beyond posterior margin of tergal plate II ... *ferrisi*

HOST RELATIONSHIPS AND DISTRIBUTION

So far I know of 95 collections, with a total of 168 specimens of Nycteribiidae from Venezuela. Of these, 133 specimens, from 77 host specimens, have been contributed by field parties of the Smithsonian Venezuelan Project. The number of collections is not large, considering the quantity of bats found among the 40,000 mammals from which 25,000 samples of ectoparasites were gathered in 48 major Venezuelan localities (Handley, 1971). In fact, nycteribiids are infrequent parasites of American bats, especially when compared with the Streblidae, and the Venezuelan collections do not disprove this observation. Even so, these data make it possible to present some interesting information on the distribution and host-parasite relationships of the nycteribiids in Venezuela.

---

[2] All characters used in the key are visible under the mid or low magnification of an entomological microscope; the specimens may be studied in alcohol or after clearing for a short time in 10% KOH.

With the exception of the two new species described in this paper (*typhlops* and *tuttlei*), all species found so far in Venezuela were previously known either from Central or South America.

B. anomala has been found in southern Mexico, Guatemala, and Nicaragua and now in Venezuela. This is the first record of a South American species of *Basilia* whose female has the abdomen with three tergal plates. Besides *B. anomala*, four other species are known from the New World with three tergal plates: *antrozoi* (Townsend, 1893); *pizonychus* Scott, 1939; *forcipata* Ferris, 1924; and *jellisoni* Theodor and Peterson, 1964. *B. antrozoi* ranges from Oregon (Con Canyon) in the United States to Guerrero, Mexico; *B. pizonychus*, a species very close to *antrozoi*, is restricted to some islands in the Gulf of California and lives on a species of bat (*Pizonyx vivesi*) of very peculiar habits which is also restricted to the same islands; *jellisoni* is known from a single specimen collected on a *Myotis* from Montana (Missoula Co.); and *forcipata*, found chiefly on Myotis, ranges from British Columbia, Canada, to San Luis Potosi, Mexico. However, another species of batfly (*B. corynorhini*) with only two tergal plates also occurs in the western United States from Utah to Texas. With the exception of the specimen from Nicaragua, collected on *Myotis*, *B. anomala* has been collected only on *Rhogeëssa tumida*. It is probable that this is its true host and that the batfly follows it from Mexico to northern South America.

B. bequaerti shows a great disjunction in its geographic distribution: Paraguay, Colombia, and Venezuela. Its hosts are *Histiotus* (*Eptesicus*) (Paraguay, 3 times) and *Micronycteris* (Colombia, once). The host species of the pair found in Venezuela is unknown, and no typical specimens of the species have been found among the nycteribiids here studied. *Micronycteris megalotis* and *Histiotus dorianus* (=*Eptesicus dorianus*) are at least partially sympatric.

B. constricta occurs in Venezuela, Colombia, Peru, and Ecuador and has been found on *Myotis nigricans* (three times), *Myotis albescens* (once), *Eptesicus brasiliensis* (once), *Tonatia amblyotis* (=*T. silvicola*) (once), *Uroderma bilobatum* (once), and *Macrophyllum macrophyllum* (once). All of these hosts are sympatric.

B. dubia shows an apparent disjunction, but the localities where it has been found are in the Amazon region or near its limits. All specimens were found on *Myotis nigricans* (two times) or on *Myotis albescens* (six times). One specimen, however, came from *Saccopteryx bilineata*; it is the first time that a nycteribiid is recorded from a bat of the family Emballonuridae.

B. ferrisi occurs in Guatemala, Costa Rica, Panamá, Colombia, Venezuela, Guyana, and Peru. In spite of records from *Molossus bondae* (?), *Uroderma bilobatum*, *Dasypterus* sp., *Molossus crassicaudatum*, and *Desmodus rotundus*, it has been found chiefly on bats of the genus *Myotis* (*nigricans*, *albescens*, and *riparius*). It is probably the commonest species of *Basilia* in the area. Its distribution is complementary to that of *B. speiseri*, which is found in Argentina (?), Brazil, and Paraguay. The recent finding of *B. astochia* Peterson and Maa, 1970, in Colombia (certainly sympatric with *ferrisi*, but morphologically very near *speiseri*) suggests that the range of *speiseri* may reach farther northward than presently known. It is really probable, as suggested by Peterson and Maa (1970), that *myotis*, *astochia*, and *speiseri* form a very closely linked "Artenkreis."

B. juquiensis is, as said above, a true puzzle. It is a very characteristic species based on a single female found on *Myotis n. nigricans* from Juquiá in the south of the State of São Paulo, Brazil. In 1956 Guimarães and D'Andretta described *B. anceps*—which is found on *Myotis n. nigricans*—based on four females from Colombia (Caqueta) and Peru (Huanuco). They suggested that since the differences between *juquiensis* and *anceps* were so subtle, that these taxa might be considered only subspecies. This concept was adopted by Theodor (1967) in his monograph. Guimarães also recorded an extension of the range of *anceps* to include Panamá. However, *B. juquiensis* is now known from Apure on *Myotis riparius*. The geographic disjunction of *juquiensis* is large and is difficult to understand possibly because of a lack of extensive collections. *Myotis nigricans* is found in Central and South America from the south of Mexico to southern Brazil and from coast to coast.

B. ortizi has been found in Venezuela associated with *Eptesicus melanopterus* (*E. brasiliensis melanopterus*) (type-host), *Eptesicus fuscus*, *Eptesicus* sp., *Myotis riparius*, and *Artibeus harti* (?). There is only one record from outside Venezuela: Peterson (1971) found it on *Eptesicus guameri* (=*E. furinalis gaumeri*) in Costa Rica.

B. tiptoni was described from Panamá from material found on bats of doubtful identification ("*Lonchorhina* or *Tonatia*": "on a bat like *Tonatia*") and on *Mimon crenulatum keenani*.

The specimens collected in Venezuela (17 male and 29 female) came from *Mimon crenulatum* (22 host specimens). It seems that the true host of *B. tiptoni* is *Mimon crenulatum.* The other species also found on *Mimon crenulatum* (*B. mimoni*) has been found only in Amazonia (Loreto, Rio Javary, Peru, and Pará, Belém, Brazil). It is possible that *B. tiptoni* occurs in the north of South America and in Central America and that *B. mimoni* occurs southward following *Mimon crenulatum*.

The two new species here described so far occur only in Venezuela: *typhlops* on *Myotis n. nigricans* and *Myotis* sp. (*oxyotus*), and *tuttlei* on *Myotis n. nigricans,* both from Bolivar.

B. wenzeli has been collected in Venezuela, Panamá, and Colombia on *Lonchorhina aurita, Artibeus jamaicensis,* and *Histiotus montanus;* but its true hosts are probably bats of the genus *Eptesicus,* on which it has been collected several times.

Of the 11 species recorded from Venezuela, only 2, here described as new, are so far exclusive to the country. All others had been previously recorded from other countries in South or Central America or both.

Of the species of *Basilia* found in Venezuela, *B. bequaerti* (Paraguay) and *juquiensis* (southern São Paulo, Brazil) reach farthest to the south, *B. ferrisi* (Guatemala) and *anomala* (Chiapas, Mexico) to the north. All species, with the exception of *B. anomala,* belong to typically South American species groups. The other species (*ortizi, tiptoni, wenzeli,* and *ferrisi*) that extend to Central America are undoubtedly of South American origin.

As to host associations, it is very clear that the genus *Basilia* is closely linked to the bat family Vespertilionidae. However, *B. tiptoni* is beyond doubt associated with a phyllostomid bat (*Mimon crenulatum*).

On the other hand the records of *ortizi* on *Artibeus harti* (Phyllostomidae) are doubtful, and the presence of *B. ferrisi* on *Desmodus rotundus* (Desmodidae) and that of *B. dubia* on *Saccopteryx bilineata* (the first record of nycteribiid on a New World emballonurid bat) are certainly no more than accidental.

LITERATURE CITED

Bequaert, J. 1942. The Diptera Pupipara of Venezuela. Boletin de Entomologia Venezolana 1(4): 79-88.

Curran, C. H. 1935. New species of Nycteribiidae and Streblidae (Diptera). American Museum Novitates 765:1-11, Fig. 1-12.

Del Ponte, E. 1944. *Basilia romañai*, nobis (Diptera, Nycteribiidae) de la Argentina. Anales del Instituto de Medicina Regional, Tucuman (Republica Argentina) 1(1):117-128, 3 fig.

Ferris, G. F. 1924. The New World Nycteribiidae (Diptera Pupipara). Entomological News 35(6): 191-199, plate III, Fig. 1.

Guimarães. L. R. 1940. Sôbre a prioridade de *Basilia ferrisi* Schuurmans-Stekhoven, 1931. Papéis Avulsos do Departamento de Zoologia, São Paulo, Brazil 1:5-7.

Guimarães, L. R. 1946. Revisão das espécies sulamericanas do genero *Basilia* (Diptera-Nycteribiidae). Arquivos de Zoologia do Estado de São Paulo, Brazil 5:1-88, 98 fig., 1 map.

Guimarães, L. R. 1966. Nycteribiid batflies from Panama (Diptera: Nycteribiidae). Ectoparasites of Panama p. 393-404, fig. 35-37. (Rupert L. Wenzel and Vernon J. Tipton. editors, Chicago, Illinois).

Guimarães, L. R. 1968. 101. Family Nycteribiidae. A Catalogue of the Diptera of the Americas south of the United States 101.1-101.7 (Museu de Zoologia da Universidade de São Paulo, editor).

Guimarães, L. R., and M. A. V. D'Andretta, 1956. Sinopse dos Nycteribiidae (Diptera) do Novo Mundo. Arquivos de Zoologia do Estado de São Paulo, Brasil 10:1-184, 232 fig., 3 tables, 5 maps.

Hase, A. 1931. Über die Lebensgewöhnheiten einer Fledermausfliege in Venezuela: *Basilia bellardii* Rondani (Fam. Nycteribiidae-Diptera Pupiara). Beitrage zur Experimentallen Parasitologie 5. Zeitschrift für Parasitenkund 3(2):220-257, 17 fig.

Handley, C. O. Jr., 1971. Ecology and Distribution of Mammalian Ectoparasites, Arboviruses, and their hosts in Venezuela. Sixth Annual Progress Report, Smithsonian Institution (mimeographed).

Karaman, Z. 1948. Beitrag zur Kenntnis der Nycteribien IV. "Rad" de l'Academie Yougoslave, Zagreb (Extrait in Germany) 273:37-46, Fig. 1-6.

Maa, T. C. 1965. An interim world list of batflies (Diptera: Nycteribiidae and Streblidae). Journal of Medical Entomology Hawaii, USA 1(4):377-386.

Machado-Allison, C. E. 1963. Un nuevo Nycteribiidae (Diptera) de Venezuela. Acta Biologica Venezuelica 3:455-459, Fig. 1-6.

Machado-Allison, C. E. 1967. Sobre algunos ectoparasitos de mamiferos de la Biota Amazonica. Atas do Simpósio sôbre a Biota Amazônica 5 (Zoologia) 365-372 (Rio de Janeiro. GB, Herman Lent, editor).

Peterson, B. V. 1960. New distribution and host records for batflies. and a key to the North American species of *Basilia* Ribeiro (Diptera: Nycteribiidae). Proceedings of the Entomological Society of Ontario (Annual Report, 1959). 90:30-37, Fig. 1-16.

Peterson, B. V. 1971. Notes on the batflies of Costa Rica (Diptera: Nycteribiidae). Contribution in Science. Los Angeles County Museum (212):1-8, Fig. 1-2.

PETERSON, B. V., AND T. C. MAA. 1970. A new species of *Basilia* (Diptera: Nycteribiidae) from Colombia. The Canadian Entomologist 102(12): 1519-1523, Fig. 1-8.

SCHUURMANS-STEKHOVEN, J. H. Jr. 1931. Eine seltene, ungenügend beschriebene *Basilia*-Art (Diptera Pupipara) aus Venezuela. Zeitschrift für Parasitenkund 3(2):205-219, Fig. 1-6.

SCOTT, H. 1936. Descriptions and records of Nycteribiidae (Diptera Pupipara), with a discussion of the genus *Basilia* Linnean Society's Journal - Zoology 39(267):479-505, Fig. 1-11.

SCOTT, H. 1939. A new species of Nycteribiidae (Diptera Pupipara) from islands in the Gulf of California. Allan Hancock Pacific Expeditions 2(10):167-170, plate 16.

SCOTT, H. 1940. Nycteribiidae from southern Brazil (Diptera). Proceedings of the Royal Entomological Society of London Series B. Taxonomy 9(4):57-61, Fig. 1-4.

STILES, C. W. AND M. O. NOLAN. 1931. Key catalogue of parasites reported for Chiroptera (bats) with their possible public health importance. National Institute of Health Bulletin number 155 (1930), Washington p. 603-742.

THEODOR, O. 1967. An illustrated catalogue of the Rothschild Collection of Nycteribiidae (Diptera) in the British Museum (Natural History) with keys and short descriptions for the identification of subfamilies, genera, species, and subspecies. British Museum (Natural History) viii + 506 p., 898 Fig., 5 pl., 6 maps, London.

THEODOR, O., AND B. V. PETERSON. 1964. On some new species of Nycteribiidae (Diptera: Pupipara). Great Basin Naturalist 24(3-4):107-115, Fig. 1-13.

NEW WORLD POLYCTENIDAE (Hemiptera), WITH SPECIAL REFERENCE TO VENEZUELAN SPECIES

by

Norihiro Ueshima[1]

ABSTRACT

There are seven species of the polyctenid genus *Hesperoctenes* which occur in Venezuela. Six of these species are reported in this paper. *H. longiceps* (Waterhouse) is redescribed. Data on distribution and hosts and a key to the 15 species of the genus *Hesperoctenes* are given.

INTRODUCTION

The family Polyctenidae in the New World is believed to be represented by only one genus, *Hesperoctenes*,[2] in contrast to four genera found in the Old World (Ferris and Usinger, 1939; Usinger, 1949, and Maa, 1964). In the genus *Hesperoctenes*, 16 species have been described. However, except for *H. fumarius* and *H. setosus* only a few specimens of each species are known. Also, the host relationships and distribution patterns of each species are not yet clearly understood.

Personnel of the Smithsonian Venezuelan Project collected over 200 specimens of *Hesperoctenes*. This large volume of material allows a better understanding of the host-parasite relationships of the New World Polyctenidae. In this paper I have presented host-parasite data, a redescription of *H. longiceps*, and a revised key to the species of *Hesperoctenes*. This paper is based on material collected by personnel of the Smithsonian Venezuelan Project (SVP).

I am greatly indebted to the late professor R. L. Usinger for allowing me to study this material and for the many helpful suggestions he gave me. I wish to acknowledge the help of Dr. C. O. Handley, Jr. (Smithsonian Institution, Washington, D. C.) and Dr. V. J. Tipton (Department of Zoology, Brigham Young University, Provo, Utah) who were responsible for organizing and carrying out the Venezuelan Project. Dr. R. L. Wenzel (Field Museum of Natural History, Chicago, Ill.) has also been generous with his help.

All of the Venezuelan specimens were collected by M. D. Tuttle, A. L. Tuttle, and F. Harder, except some specimens from Sucre and Monagas were collected by N. E. Peterson, R. B. Peacock, and D. B. Peacock.

Hesperoctenes longiceps (Waterhouse)

Polyctenes longiceps Waterhouse, 1880:319.– Speiser, 1904:376.– 1909:272.

Hesperoctenes longiceps, Horvath, 1911:251.– Costa Lima, 1920:69-70.– Jordan, 1922:214-15.– Ferris and Usinger, 1939:22.– Usinger, 1946:14.– Ronderos, 1959:180.– 1962:71.

Parahesperoctenes hechti, Hoffman and Vargas, 1947:219-28.

REDESCRIPTION

MALE: *Head* about 0.82 mm long; distinctly longer, including labrum, than width posteriorly, 34:30. Labrum three times as long at middle as at sides, 6:2. Clypeus with about 25 bristles on middle of posterior half of disk, with single row of bristles just outside of suture, posteriorly continuing to basal group of about 20 bristles;

---

[1] Matsusaka College, Kubo-cho, Matsusaka, Mie, Japan.

[2] A. Hoffman and L. Vargas (1947) described another genus, *Parahesperoctenes* from Venezuela, based on a single female. Their main generic characters differentiating *Parahesperoctenes* from *Hesperoctenes* were two genal combs and two longitudinal combs on the second antennal segment. I believe that their specimen was *H. longiceps* in the process of molting from the last instar to the adult, as stated by Ronderos (1962*a*). My reasons are as follows: (a) as stated by Hoffman and Vargas, there was a doubling of the genal combs and longitudinal combs of the second antennal segment; (b) from the illustrations, the following are apparently double structures: occipital comb, long erect bristles of mid and hind femora, long erect bristles of mid and hind tibiae, mid and hind tarsi (see their Fig. 1 and 4), and short and stout bristles of prosternal region. From this evidence, most of the significant characters are doubled, suggesting that the skin of the last instar nymph might still be with the specimen. Of course, if additional specimens were found with doubling of bristles and ctenidia this conclusion would have to be reexamined. As for the probable identity of the species, the head is distinctly longer than broad and the second antennal segment is longer than the third or fourth (these are key characters to *H. longiceps*).

discolateral areas with about 55 bristles in each; sublateral setiferous areas with about 12 bristles in each; genal combs roundly angular anterolaterally. Hypostomal region with about nine pairs of fine bristles in addition to pair of prominent bristles, naked at posterior margin. Antennae about 1 mm long; proportion of segments, 6:12:11:11; first segment with about 12 short bristles anteriorly, with several slender bristles on anterior and posterior margins; teeth on comb of second segment short and stout, about one-half as long as occipital comb. Rostrum 0.2 mm long; proportion of segments, 5:5:7. *Thorax.* Pronotum 1 mm wide; more than one-half again as wide as long, 40:25; disk covered with rather sparsely placed bristles; two pairs of long bristles posterolaterally, longest bristles much longer than first antennal segment. Prosternum less than one-half again as long as wide, 17:12; anterior margin with 7-8 very stout bristles on either side, with slender bristles at middle; with one to three rows of long and slender bristles just behind anterior margin; posterior disk with about 40 small scattered bristles. Hemelytral pads distinctly longer than wide, 25:20; inner anterior area naked. Metasternum with bristles except at middle. Metapleura beneath with 8 very stout bristles arranged in two or three rows. Front femora with row of 6 stout bristles on anterior margin; about one-half again as long as greatest width, 20:13. Middle and hind femora with long erect bristles, 0.2 mm long. Middle tibiae with 4 long, erect bristles, longest ones 0.4 mm long and much longer than second antennal segment. Hind tibiae with 3 long erect bristles, as long as on middle tibiae.

FEMALE.—*Head* about 0.7 mm long; distinctly longer, including labrum, than width posteriorly, 32:27. Labrum three times as long at middle as at sides, 6:2; clypeus with about 20 scattered bristles on middle of posterior half of disk, with single row of bristles just outside of sutures, posteriorly continuing to basal group of about 12 bristles; discolateral areas with about 55 bristles in each; sublateral setiferous area with about 12 bristles in each; genal combs roundly angular anterolaterally. Hypostomal region with about seven pairs of fine bristles in addition to pair of prominent bristles, naked at posterior margin. Antennae about 1 mm long; proportion of segments, 6:12:11:11; first segment with about 12 short, stout bristles anteriorly, with several slender bristles on anterior and posterior margins; teeth on comb of second segment short and stout, about one-half as long as occipital combs; third segment with long bristles, as long as first antennal segment. Rostrum 0.2 mm long; proportion of segments, 5:5:7. *Thorax.* Pronotum 0.98 mm wide; more than one-half again as wide as long, 37:23; the disk covered with rather sparsely placed bristles; two pairs of long bristles posteriorly, longest bristles much longer than first antennal segment. Prosternum one-half again as long as wide, 18:12; anterior margin with 6-8 very stout bristles on either side, with slender bristles at middle; with one or two rows of long and slender bristles just behind anterior margin; posterior disk with about 40 small scattered bristles. Hemelytral pads distinctly longer than wide, 25:20; inner anterior area naked. Metasternum with bristles except at middle. Metapleura beneath with 8 very stout bristles arranged in two or three rows. Front femora with row of 6 stout bristles on anterior margin; about one-half again as long as greatest width, 18:13. Middle and hind femora with long erect bristles, 0.2 mm long. Middle tibiae with 4 long erect bristles, longest ones 0.4 mm long and much longer than second antennal segment. Hind tibiae with 3 long, erect bristles, as long as on middle tibiae.

MALE.—(slide mounted) holotype, length 3.25 mm, width (pronotum) 1 mm, (abdomen) 0.9 mm; female (slide mounted), length 3.3 mm, width (pronotum) 0.98 mm, (abdomen) 1 mm.

Redescribed from the male holotype, Guatemala, kindly sent from the British Museum. The female was described from the specimen taken 19 km NW Urama, Yaracuy, Venezuela, 19-III-1966 (M.D. Tuttle and A.L. Tuttle), ex *Eumops auripendulus* (SVP 6861).

H. longiceps was originally described by Waterhouse (1880). He stated, "Two specimens found by my colleague, Mr. Oldfield Thomas, on a bat, *Mollossus abrasus* Temminck." Jordan (1922) stated, "I have seen only ♀♀" and "In Mus. Brit. (sic) from Cajaban, Guatemala; three ♀♀ and one ♀ nymph." However, Ferris and Usinger (1939) stated, "A single nymph, Guatemala, British Museum, 1880-120. The accompanying drawing from the unique male type in the British Museum is by W. E. China." Their statement agrees with the statement by Waterhouse (1880). Apparently, the British Museum has the male holotype and a nymph paratype, in addition to one male taken in December 1933 by L. H. Dunn in Panama City. Jordan's specimens could not be located in the British Museum.

The key character used by Ferris and Usinger (1939) for *longiceps*, i.e. posterior pleurites beneath with a single row of 6 stout bristles, turned out to be incorrect. The holotype apparently has two or three rows of 8

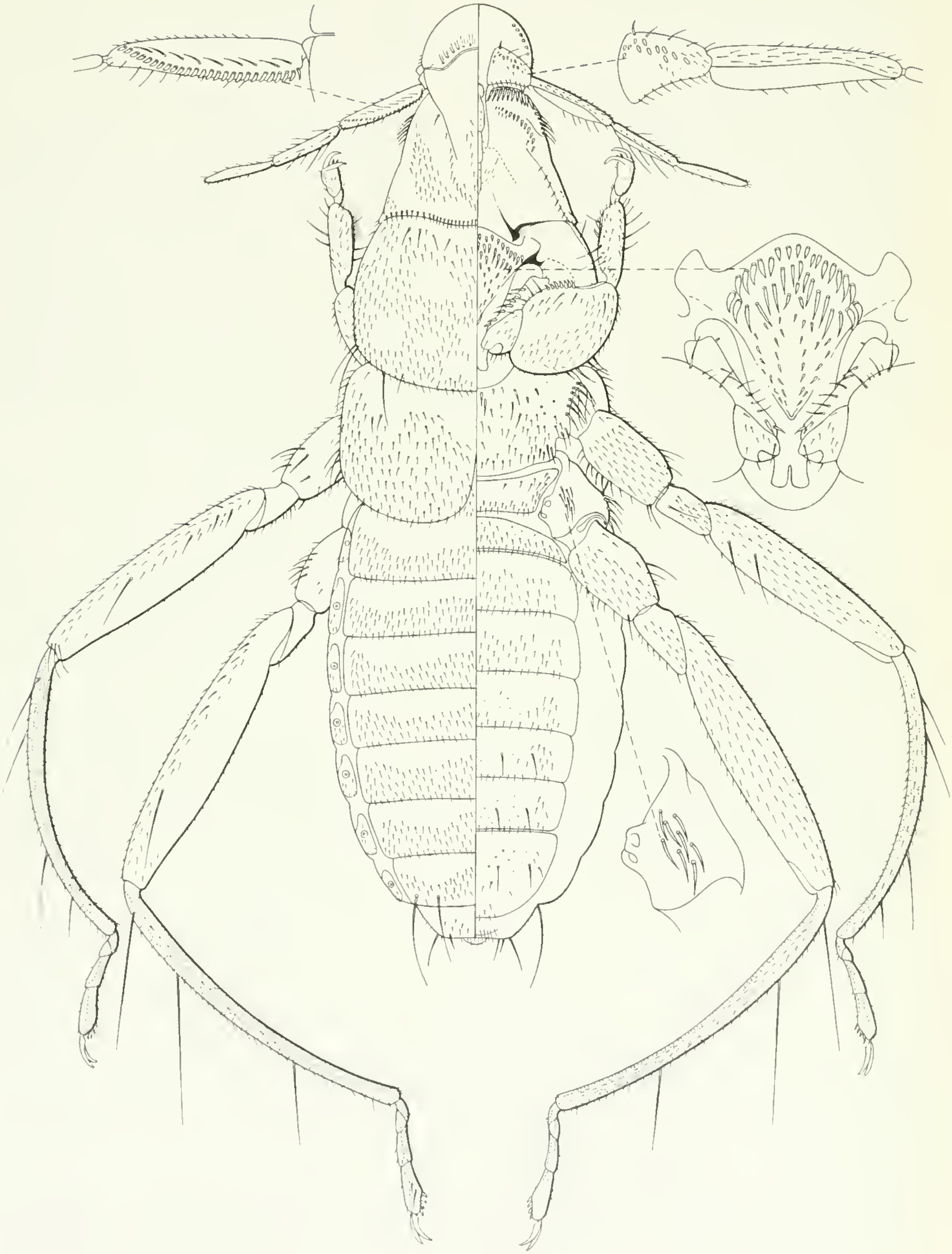


Fig. 1. *Hesperoctenes longiceps* (Waterhouse), female (Celeste Green, original).

bristles on the posterior pleurites. Also the measurement given by them was not accurate; the length of the holotype is 3.25 mm, not 4.3 mm.

Venezuelan Records

Three females ex *Eumops auripendulus* (SVP 6861, 6862). Yaracuy. 19 km NW Urama, 25 m elev., 9-III-1966; 8 females, 1 male ex *Eumops glaucinus* (SVP 26994, 27862, 27866, 27869, 28369), T. F. Amazonas. Tamanaco, 6 km NE San Juan. Manpiare, 155 m elev., 17-23-VII-1967; 1 female ex *Molossus ater* (probable contamination) (SVP 28770), same data as above.

Hesperoctenes hermsi Ferris and Usinger

Venezuelan Records

Two females, 1 male, 1 nymph ex *Tadarida gracilis* (SVP 6344. 6349, 6355. 6360), Apure, Río Cinaruco, 41 km NW Pto, Paez 76 m elev., 21-I-1966; 1 female ex *Eumops glaucinus* (SVP 27869), T. F. Amazonas, Tamanaco. 6 km NE San Juan, Manapiare. 155 m elev., 19-VII-1967.

Hesperoctenes cartus Jordan

Venezuelan Records

One female, 4 nymphs ex *Molossops planirostris* SVP 27859, 27886. 27893, 27895. 27925), T. F. Amazonas, Tamanaco, 6 km NE San Juan, Manapiare, 145-155 m elev., 19-VII-1967. Also 1 female, 1 nymph ex *Molossops planirostris* (Tipton 6589), Panama Canal Zone, Corozal. 22-XI-1960.

Hesperoctenes setosus Jordan

Venezuelan Records

Six females. 2 males, 6 nymphs ex *Tadarida gracilis* from three localities: (SVP 6448) Apure, Rio Cinaruco, 41 km NW Pto. Paez. 76 m elev., 25-I-1966; (SVP 6604, 6610. 6618, 6620, 6624) T. F. Amazonas, Rio Orinoco. Boca Mavaca, 68 km SE Esmeralda, 185 m elev., 14-II-1966; (SVP 6648, 6652, 6653, 6659. 6665, 6666. 6667) same locality but 16-II-1966; (SVP 15723) T. F. Amazonas. mouth of Rio Huachamacari in a valley at the foot of Cerro Huachamacari in the general area of Belen and Rio Cunucunuma, 150 m elev., 13-I-1967; 5 females, 1 male and 5 nymphs ex *Tadarida europs* (SVP 6591. 6593, 6594, 6605, 6608. 6637), T. F. Amazonas, Rio Orinoco, Boca Mavaca 68 km SE Esmeralda, 185 m elev., 14-II-1966.

Hesperoctenes fumarius (Westwood)

Venezuelan and Other Records

See Table 1.

Table 1. Venezuelan Records of *Hesperoctenes fumarius* (Westwod)

HOST	LOCALITY AND DATE	FIELD NUMBERS	STAGE AND NUMBER
Eumops trumbulli	COLOMBIA: Meta, Pto. Hopez. XI-1966	6060	1F
Eumops bonariensis	BOLIVIA: Beni, San Joaquin. 7-VI-1963 (853), 8-IX-1963 (2505)	853, 2505	3FF, 1N
Molossus ater	VENEZUELA: Apure, 60 km NE Pto. Paez, Hato Cariben Río Cinareuco, XII-1965	SVP 5657, 5658, 5731 5736, 5750. 5776	1F 4MM, 4NN
	Monagas. 3 km N and 4 km W Caripe, San Agustin, VI-1967 (SVP 13728-13798) VII-1967 (SVP 13971-14104)	SVP 13719. 13721, 13723. 13726, 13730. 13738. 13748, 13751 13753. 13762, 13770, 13774, 13776, 13793 13798, 13971. 13972, 13973, 13975, 13976, 13978. 13979. 13999, 14002 14003. 14004, 14008, 14040. 14048, 14053 14055, 14104	24FF, 16MM, 25NN
	T. F. Amazonas, 68 km SE Esmeralda, Boca Mavaca 8-III-1967	SVP 16761	1F, 1N
	T. F. Amazonas, 5 km N San Juan W side Rio Manapiare, 5-VII-1967	SVP 25432, 25433	2FF
	T. F. Amazonas. Lagoon Nr. Tamanaco, ca. 4 km NE San Juan, Manapiare, VII-1967	SVP 26703, 26704. 26705, 26706, 26748. 26748 26479. 26752	2FF. 10MM 5NN
	T. F. Amazonas huge lagoon extending to ca. 2 km N Tamanaco. N San Juan. Manapiare,	SVP 27302, 27307, 27749, 27806,	1F, 5MM,

Table 1 (continued).

	VII-1967	27822, 28380, 28772, 28800, 28806	5NN
Molossus aztecus	T. F. Amazonas, 68 km SE Esmeralda, Boca Mavaca, Rio Orinoco, 16-II-1966	SVP 6675, 6680, 6682, 6683	1F, 2MM, 1N
Molossus bondae	Yaracuy-Carababo border, 10 km NW Urama, Rio Yaracuy, III-1966	SVP 7149, 7300	2MM, 1N
Molossus ater	Bolivar, 59 km SE El Dorado, km 74, El Manaco, VI-1966	SVP 9129, 9510, 9892	1F, 3MM, 2NN
	Sucre, 14 km E Cumana, Hda. Guanital, XII-1966	SVP 11738, 11804, 11737	1F, 2MM
	T. F. Amazonas, Rio Cunucunuma, Belen, 7-I-1967	SVP 15580	1N
Molossus aztecus	T. F. Amazonas, huge lagoon extending to ca. 2 km N Tamanaco, N San Juan, Manapiare, 18-VII-1967	SVP 27348, 27747, 27748	2FF, 1M
Molossus major	Barinas, 2 km SW Altamira, La Vega del Rio Santo Domingo, 27-XII-1967	SVP 33796	1F
Molossops planirostris	T. F. Amazonas, huge lagoon extending to ca. 2 km N Tamanaco, N San Juan, Manapiare, VII-1967	SVP 27893, 27894, 28004, 28009, 28128, 28150, 28779	2FF, 5MM, 2NN
Noctilio labialis	T. F. Amazonas, lagoon nr. Tamanaco, ca. 4 km NE San Juan, Manapiare, 14-VII-1967	SVP 26708	1M
Promops centralis	Bolivar, 14 km S and 45 km E Caicara, Hato La Florida, 5-V-1967	SVP 12990	1F, 1M
Rhynchonycteris naso	T. F. Amazonas, Tamanaco, ca. 4 km NE San Juan, Manapiare, 18-VII-1967	SVP 27389	1M, 2NN
Pteronotus parnellii	Monagas, San Agustin, 3 km N and 4 km W Caripe, 1165 m elev., 26-V-1967	SVP 13718	1N

Hesperoctenes angustatus Ferris and Usinger

Venezuelan Records

Fifteen females, 9 males, 4 nymphs ex *Eumops glaucinus*, T. F. Amazonas, Tamanaco, 6 km NE San Juan Manapiare, 155 m elev., 17-VII-1967 (SVP 26868, 26975, 26976, 26992, 26993, 26994, 26995, 27008, 27010, 27012) and 19-VII-1967 (SVP 27823, 27995, 28576).

Hesperoctenes sp.

Venezuelan Records

Three females, 1 nymph ex *Artibeus fuliginosus* (SVP 27897); T. F. Amazonas, Rio Cunucunuma, Acanana, 145 m elev., VI-1967; 2 nymphs ex *Eumops glaucinus* (SVP 9512); Bolivar, 59 km SE El Dorado, 150 m elev., 17-VI-1966. (Note the first host should be regarded as a possible contamination and the second host is a field identification.)

HOST RELATIONSHIPS AND DISTRIBUTION

So far 16 species have been described in the genus *Hesperoctenes*. At present, the taxonomic status of *H. tarsalis*, from an unknown host in Nicaragua, is not clear, since no specimens of the species have been available. Following is a summary of the distribution and host relationships of each species of *Hesperoctenes*.

H. abalosi was described from *Promops*(?) sp. in Argentina. No further information was available.

H. angustatus was originally described from British Guiana, and subsequently the species has been found on *Eumops glaucinus* in Panama and Venezuela.

H. cartus was originally known from *Tadarida gracilis* in Brazil. Subsequently the species was collected from *Molossops cerastes* (=*M. brachymeles*) in Paraguay and from *Molossops planirostris* in Colombia, Panama, and Venezuela.

H. chorate was only known from *Molossops* sp. in Argentina.

H. eumops has been found from *Eumops perotis* (=*E. californicus*) in southern California, USA.

H. fumarius is widely distributed in the cen-

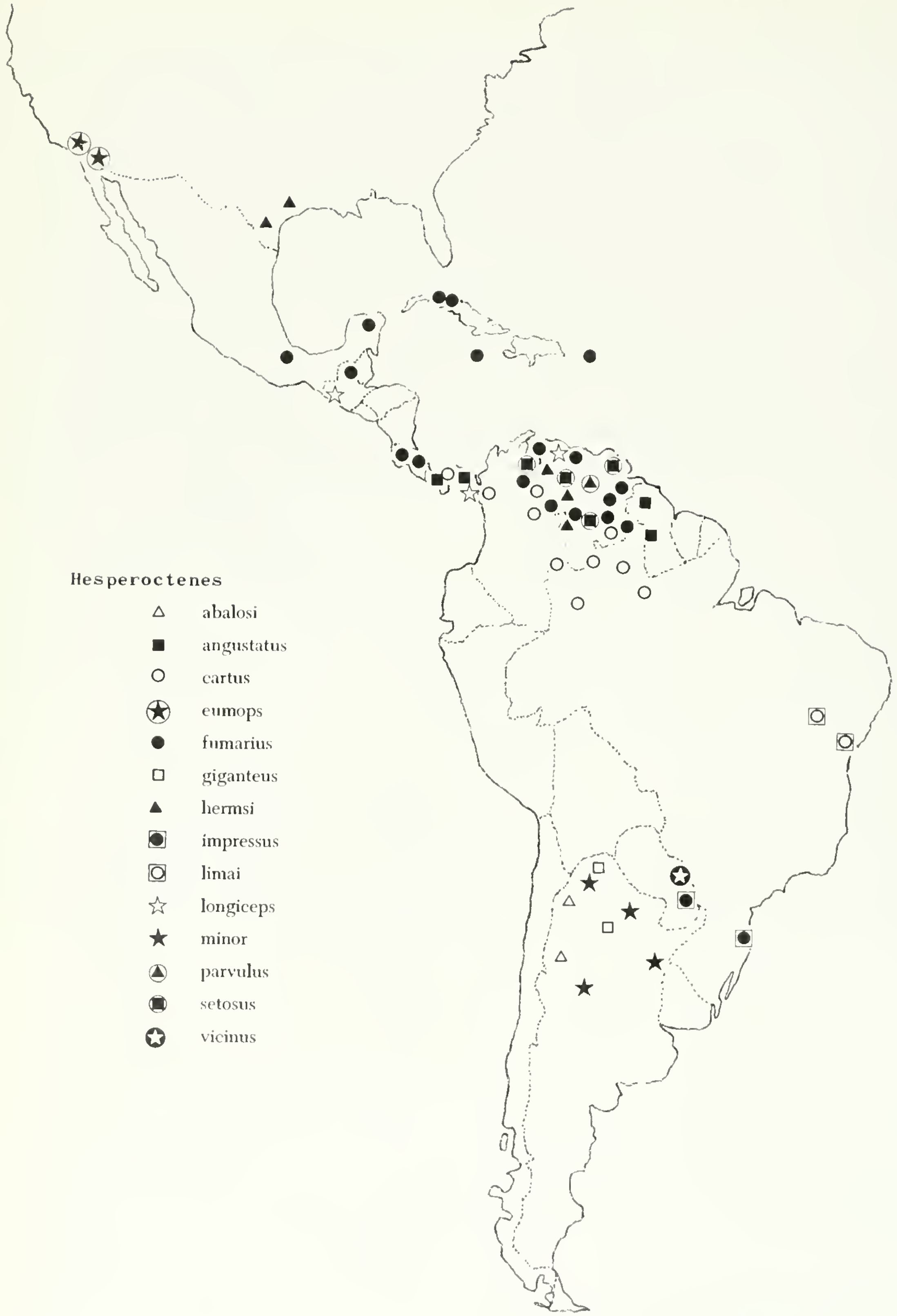

Hesperoctenes
△ abalosi
■ angustatus
○ cartus
eumops
● fumarius
□ giganteus
▲ hermsi
impressus
limai
☆ longiceps
★ minor
parvulus
setosus
vicinus

Fig. 2. Distribution map of *Hesperoctenes* species.

tral and northern part of South America and West Indies. The known hosts of this species are as follows: *Molossus ater*, *M. aztecus*, *M. bondae*, *M. major*, *M. obscurus*, *M. pretiosus* (=*M. ater*), *M. tropidorhynchus*, *Molossops planirostris*, *Eumops bonariensis*, *E. trumbulli*, and *Promops centralis*. In addition to the hosts mentioned above, specimens of this species were collected from the bulldog bat, *Noctilio labialis* (Noctilionidae), and *Rhynchonycteris naso* (Emballonuridae) in Venezuela. I assume the association of *H. fumarius* with those bats is accidental. Walker (1964) stated that "*Noctilio* and *Molossus* are often found roosting in the same trees and buildings" and "*Noctilio labialis* has been found in the same hollow trees as *Molossus major*." From the above statement, I believe that polyctenids on *Molossus* move to *Noctilio* accidentally while they are roosting together.

H. giganteus was originally described from *Eumops* in Argentina, and no further information was available.

H. hermsi was collected from *Tadarida macrotis* (=*T. molossa*) in Texas (USA). As stated previously the specimens were collected from *Tadarida gracilis* in Venezuela. From this evidence, the species may be widely distributed in Central America and the northern part of South America.

H. impressus is known from Brazil and Paraguay. The host of this species is probably *Molossops cerastes* (=*M. brachymeles*).

H. limai is known only from Brazil and there is no information concerning the host.

H. longiceps is known from *Molossus abrasus* (=*Eumops auripendulus*) in Guatemala and from *Eumops auripendulus* and *E. glaucinus* in Venezuela.

H. minor was originally described from *Tadarida* sp. in Argentina and no further collection was available.

H. parvulus is only known from *Glossophaga longirostris* (Phyllostomatidae) in Venezuela. The host association of the species is quite unusual. Further specimens and information on the host are badly needed.

H. setosus was originally recorded from *Tadarida* sp. (as *Nyctinomus*) in Venezuela. Many specimens were collected from *Tadarida gracilis* in Venezuela.

H. vicinus is known only from Paraguay and the probable host is *Molossus rufus* (=*M. ater*).

The distribution patterns of *Hesperoctenes* species are shown in Fig. 2.

Key to the Species of *Hesperoctenes*[3]

1. Head on underside with a patch or row of bristles at middle of hind margin 2
Head on underside without bristles at middle of hind margin 8

2. Bristles on body very numerous and regularly placed, the pronotal disk with only a small hook-shaped bare area on either side of middle 3
Bristles on body much sparser and more irregularly placed, pronotal disk with numerous bare areas 4

3. First segment of antennae as long as third segment. Hind margins of front femora more strongly rounded at the middle. Metasternum with a bare area on the anterior half at middle, size large. *Tadarida*. Texas (USA) and Venezuela .... *hermsi* Ferris and Usinger
First antennal segment shorter than third. Posterior or outer margins of front femora more strongly rounded basally. Metasternum entirely setose. Size small. *Tadarida*. Venezuela .... *setosus* Jordan

4. Head below with an irregular double row of 10-14 bristles at middle of hind margin. *Molossops* and *Tadarida*. Brazil, Colombia, Venezuela, and Paraguay .... *cartus* Jordan
Head below with an irregular double row of 6-8 bristles at middle of hind margin. 5

5. First antennal segment equal to third segment in length 6
First antennal segment unequal to third segment in length 7

6. Labrum less than four times broader than long. *Molossus*. Paraguay .... *vicinus* Jordan
Labrum more than four times broader than long. *Molossus*. Argentina .... *chorate* Ronderos

---

[3] A revision of Ferris and Usinger's 1939 and Ronderos' 1962 keys

7. Metapleurites with 6-7 bristles of irregular size. *Glossophaga* (?) Venezuela .... *parvulus* Ferris and Usinger

Metapleurites with 8-11 long and stout bristles. *Tadarida*. Argentina .... *minor* Ronderos

8. Head at median line longer than broad at base 9

Head at median line shorter than broad at base 12

9. Second antennal segment less than twice as long as first. Head scarcely longer than broad 10

Second antennal segment twice or more as long as first. Head distinctly longer than broad 11

10. Second, third, and fourth antennal segments equal. Metapleurites with 6-9 very stout bristles in two or three ill-defined rows. *Eumops*. British Guiana, Panama, Venezuela .... *angustatus* Ferris and Usinger

Second antennal segment longer than third or fourth. Metapleurites with a group of long bristles perpendicularly on median portion of coxal edge and a row of 9 stout bristles. *Promops*(?) sp. Argentina .... *abalosi* Del Ponte

11. Second antennal segment more than twice as long as first. Labrum two and one-half times as wide as long at middle. Host unknown. Brazil .... *limai* Ferris and Usinger

Second antennal segment twice as long as first. Labrum three times as wide as long at middle. *Eumops*. Guatemala, Venezuela .... *longiceps* (Waterhouse)

12. Head scarcely broader than long. Pronotum a little more than half again as long as broad 13

Head distinctly broader than long. Pronotum almost twice as broad as long 14

13. Lateral margins of pronotum semiconvergent. Mesonotal lobes subquadrate. Front femur strongly curved at middle of posterior margin. *Eumops*. California (USA) .... *eumops* Ferris and Usinger

Lateral margins of pronotum subparallel. Mesonotal lobes subtriangular. Front femur with posterior margin uniformly curved. *Eumopes*. Argentina .... *giganteus* Ronderos

14. Metapleurites with 6-8 long bristles. Metasternum with bristles except at middle. *Molossus*, *Eumops*, *Molossops*. Central and South America and West Indies .... *fumarius* (Westwood)

Metapleurites with 10-12 bristles. Metasternum with bristles confined to the posterior and lateral margins. *Molossops*. Brazil, Paraguay .... *impressus* Horvath

LITERATURE CITED

Costa Lima, A. da. 1920. Contribuicao para o conhecimento dos insectos da familia Polyctenidae. Archives Escola Superior de Agricultura e Medicina Veterinaria. Nietheroy 4:61-76.

Del Ponte, E. 1945. *Hesperoctenes abalosi* new species (*Hemiptera, Polyctenidae*). Anales del Instituto de Medicina Regional, Tucuman 1:129-130.

Ferris, G. F., and R. L. Usinger. 1939. The family Polyctenidae (Hemiptera: Heteroptera). Microentomology 4:1-50.

Ferris, G. F., and R. L. Usinger. 1945. Notes and descriptions of American Polyctenidae (Hemiptera). Pan Pacific Entomologist 21:121-124.

Hoffman, A., and L. Varga. 1947. *Parahesperoctenes hechti* new genus, new species de Venezuela. Revista del Instituto de Salubridad y Enfermedales Tropicales (Mexico) 8:219-228.

Horvath, G. 1911. Les Polyctenides et leur adaptation à la vie parasitaire. Memoires du Congres International d'Entomologie, Bruxelle 2:249-256.

Jordan, K. 1922. The American Polyctenidae. Ectoparasites 1:204-215.

Maa, T. C. 1964. A review of the Old World Polyctenidae (Hemiptera: Cimicoidea). Pacific Insects 6:494-516.

Ronderos, R. A. 1959. Polyctenidae Americanos. I. (Hemiptera). Actas y Trabajos del Primer Congreso Sudamericano de Zoologie 3:173-180.

Ronderos, R. A. 1962*a*. Polyctenidae Americanos. II. (Hemiptera). Acta Zoologica Lilloana 18:259-262. Gigl.

Ronderos, R. A. 1962*b*. Nuevos aportes para el conocimiento de los Polyctenidae Americanos (Hemiptera). Anales del Instituto Nacional de Microbiologie 1:67-76.

SPEISER, P. 1904. Die Hemipterengattung Polyctenes Gigl. und ihre Stellung im System. Zoologische Jahrbucher, Supplement 7:373-380.

SPEISER, P. 1909. The hemipterous family Polyctenidae. Records of an Indian Museum 3:271-274.

USINGER, R. L. 1946. Polyctenidae. General Catalogue. Hemiptera 5:1-18.

WALKER, E. P. et al. 1964. *Mammals of the world.* Johns Hopkins Press, Baltimore 1:643.

WATERHOUSE, C. O. 1880. Description of a new species of the anomalous genus *Polyctenes*. Transactions of the Entomological Society of London 1880:319-320.

S-NA-F(rovo)

Brigham Young University
Science Bulletin

MUS. COMP. ZOOL.
LIBRARY

FEB 2 1973

HARVARD
UNIVERSITY

VENEZUELAN AMBLYOPININI (INSECTA: COLEOPTERA; STAPHYLINIDAE)

by

C. E. Machado-Allison
and
Alfredo Barrera

LABIDOCARPID BAT-MITES OF VENEZUELA (LISTROPHOROIDEA: LABIDOCARPIDAE)

by

Burruss McDaniel

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 2

SEPTEMBER 1972

BRIGHAM YOUNG UNIVERSITY SCIENCE BULLETIN

BIOLOGICAL SERIES

Editor: Stanley L. Welsh, Department of Botany,
Brigham Young University, Provo, Utah

Members of the Editorial Board:

Vernon J. Tipton, Zoology
Ferron L. Andersen, Zoology
Joseph R. Murdock, Botany
Wilmer W. Tanner, Zoology

Ex officio Members:
A. Lester Allen, Dean, College of Biological and Agricultural Sciences
Ernest L. Olson, Chairman, University Publications

The Brigham Young University Science Bulletin, Biological Series, publishes acceptable papers, particularly large manuscripts, on all phases of biology.

Separate numbers and back volumes can be purchased from Publication Sales, Brigham Young University, Provo, Utah. All remittances should be made payable to Brigham Young University.

Orders and materials for library exchange should be directed to the Division of Gifts and Exchange, Brigham Young University Library, Provo, Utah 84601.

Brigham Young University
Science Bulletin

VENEZUELAN AMBLYOPININI (INSECTA: COLEOPTERA; STAPHYLINIDAE)

by

C. E. Machado-Allison
and
Alfredo Barrera

LABIDOCARPID BAT-MITES OF VENEZUELA (LISTROPHOROIDEA: LABIDOCARPIDAE)

by

Burruss McDaniel

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 2

SEPTEMBER 1972

TABLE OF CONTENTS

VENEZUELAN AMBLYOPININI (INSECTA: COLEOPTERA; STAPHYLINIDAE)

- INTRODUCTION ... 1
- SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTION ... 1
  - Genus *Amblyopinus* Solsky ... 1
    - *Amblyopinus proximus*, new species ... 1
    - *Amblyopinus waterhousei* Fauvel ... 2
    - *Amblyopinus metasternalis*, new species ... 4
    - *Amblyopinus seeversi* (Machado-Allison and Barrera) ... 6
    - *Amblyopinus intermedius*, new species ... 6
    - *Amblyopinus schmidti schmidti*, new status ... 8
    - *Amblyopinus schmidti bolivari*, *new status* ... 8
    - *Amblyopinus emarginatus* Seevers ... 8
  - Genus *Amblyopinodes* Seevers ... 8
    - *Amblyopinodes venezolanus*, new species ... 8
    - *Amblyopinodes major*, new species ... 11
- SUMMARY ... 13
- RESUMEN ... 13
- LITERATURE CITED ... 14

LABIDOCARPID BAT-MITES OF VENEZUELA (LISTROPHOROIDEA: LABIDOCARPIDAE)

- INTRODUCTION ... 15
- SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTION ... 15
  - Genus *Alabidocarpus* Ewing ... 15
    - *Alibidocarpus furmani* Pinichpongse ... 15
    - *Alabidocarpus nicaraguae* McDaniel ... 16
    - *Alabidocarpus jonesi* McDaniel ... 18
  - Genus *Parakosa* McDaniel and Lawrence ... 20
    - *Parakosa tadarida* McDaniel and Lawrence ... 20
    - *Parakosa maxima* McDaniel ... 22
  - Genus *Lawrenceocarpus* Dusábek and Cruz ... 24
    - *Lawrenceocarpus phyllostimus*, new species ... 24
  - *Pseudoalabidocarpus*, new genus ... 25
    - *Pseudolabidocarpus secus*, new species ... 26
  - Genus *Labidocarpus* Trouessart ... 28
    - *Labidocarpus dossuarius*, new species ... 28
  - Genus *Paralabidocarpus* Pinichpongse ... 30
    - *Paralabidocarpus tonatiae* Fain ... 30
  - Key to the Venezuelan Genera of Labidocarpidae ... 30
- HOST PARASITE LIST OF VENEZUELAN LABIDOCARPID BAT-MITES ... 31
- LITERATURE CITED ... 32

VENEZUELAN AMBLYOPININI (INSECTA: COLEÓPTERA, STAPHYLINIDAE)

by

C. E. Machado-Allison[1] and Alfredo Barrera[2]

ABSTRACT

Eight species of the tribe Amblyopinini are known from Venezuela. The descriptions of five species (*Amblyopinus proximus*, *A. intermedius* and A. *metasternalis* plus *Amblyopinodes major* and *A. venezolanus*) are given in this paper. *Megamblyopinus seeversi* Machado-Allison and Barrera is placed in the genus *Amblyopinus* and *A. bolivari* Barrera, Machado-Allison and Muñiz is reduced to a subspecies of *A. schmidti* Seevers. Data on hosts and distribution are given for the new species as well as *A. emarginatus* Seevers and *A. waterhousei* Fauvel.

INTRODUCTION

Ectoparasites which have extraparasitic phases in their life cycles are influenced by ecological factors in such a way that frequently their geographic distribution is less extensive than that of their hosts. Many species of Amblyopinini are restricted to montane habitats and temperate or even cold climates. Very few species are adapted to dry or warm climates, and only one species, *Amblyopinus gahani* (Fauvel), is found in a semiaquatic environment.

The Eastern Andes of Colombia are divided northward into two branches—to the west the Serrania de Perija and to the east the Cordillera de Merida. Since the mountains of Venezuela have Andean characteristics, close resemblance between the Venezuelan and Colombian fauna should be expected. Surprisingly, only two species, *Amblyopinus emarginatus* Seevers and *A. waterhousei* Fauvel, are present in both countries. None of the other eight species of *Amblyopinus* known from Colombia has been found in Venezuela, and none of the other six known Venezuelan species has been recorded from Colombia.

This remarkable endemism suggests that many new species and valuable biogeographical information will be found in the future when relatively isolated, montane areas, such as the Sierra Nevada de Santa Marta in Colombia, the mountain ranges of Margualida, Parima, Pacaraima, Turagua, Zamuro, and the "tepuies" of Venezuela are investigated for this peculiar group of parasites.

Based on material collected by Smithsonian Venezuelan Project personnel, new records of previously known species are given in this paper. Five new species are described, two in the genus *Amblyopinodes* Seevers and three in the genus *Amblyopinus* Solsky. Also, we include a review of the status of *Amblyopinus bolivari* Barrera, Machado-Allison, and Muñiz 1960, described from Mexico.

SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTION

Genus *Amblyopinus* Solsky

Three new species of this genus are described below.

Amblyopinus proximus, new species

(Fig. 1-4)

DESCRIPTION

Relatively slender, not highly sclerotized. Total length between 8 and 9 mm.

MALE: Labrum small, with 6 or 7 small setae on each side of anterior margin; 2 of these conspicuous, 1 longer than the other.

---

[1] Instituto de Zoologia Tropical, Universidad Central de Venezuela
[2] Museo de Historia Natural de la Ciudad de Mexico

Posterolateral angles of genal area small, rounded. Eyes small, multifaceted. Ocular margin with 7 stout setae. Antennae long, with first segment one-third longer than second. Submentum with anterior margin concave, with 4 or 5 small setae on each side, 1 longer than others; gula with anterior margin almost straight, with 2 long, separated setae and about 8 shorter setae on each side. Posterior half of gula naked. Post-genal area narrower than one-third of distance between posterolateral angles. *Thorax.* Anterior margin of pronotum almost straight, with anterior angles prominent, separated by distance equal to maximum length of pronotum. Posterior margin of pronotum with 1 dark, long seta on each side, close to posterior angles. Elytra as long as wide, with dense coating of short and long acicular setae, intermixed. Prosternum wide, elevated, with anterior margin straight; one pair of long, dark medial setae and about 40 small ones of irregular distribution. Mesosternum with anterior margin convergent to apex which is deeply inserted between coxae. Chaetotaxy consisting of 6 long, dark setae, plus 8 smaller, thinner ones. Metasternum (Fig. 1) small, with very small sinus and setae uniformly scattered on anterior two-thirds of surface. *Legs.* Tibiae of mesothoracic legs with strong setae, particularly those of apical region. Tarsal segments (Fig. 2) slightly widened, with sparse ventral pilosity on first three tarsomeres. (This combination allows the separation of this species from those which have very wide segments and abundant setae and also from those species which have modified legs.) Prothoracic and mesothoracic legs as in other species of genus. *Abdomen.* Tergites II to VII with 1 long, dark seta on each side; VIII without long dark setae, but some curved, short setae, prominent over abundant aciculate setae of tergite. Sternites III and IV without any long dark setae; V and VI with 1 macroseta on each side; VII and VIII with 2. *Modified segments and genitalia.* Cerci densely covered with short setae on entire surface; long and dark setae restricted to posterior half. Phallic organ (Fig. 3) with dorsal margin of parameres almost straight on posterior half. Ventral margin almost straight for posterior one-third, with gradual curvature behind basal setae. Fine, reduced teeth on ventral margin between proximal setae and one-half distance between proximals and distals. Two additional teeth, very small, at each side of distal pair of setae; apex of parameres small, rounded; movable sclerotized piece short, rhomboidal (Fig. 4). Dorsal lobe of phallobase apex as in Fig. 4.

Female: Mesosternum with almost all setae as described in male but stronger. Sternite VIII with 2 or 3 long, dark setae on each side, with posterior margin slightly sinuated. Tergite VIII with small, curved setae as described in male. Cerci slender, longer than in male. Tergite IX with many long aciculate setae. Coxites slender, almost as long as cerci. Chaetotaxy of tergites and sternites as in male with some specimens having 2 long setae on tergite V instead of 1 on each side.

Diagnosis

A. proximus, new species, belongs to the *jelskii* group of Seevers. The shape of the male genitalia and the incipient modification of the mesothoracic legs allows its separation from all the other species of the genus.

Type Data: Male holotype and female allotype ex *Akodon urichi* (SVP 16024), T. F. Amazonas, Cerro Duida, Cabecera del Caño Culebra, 1400 m elev., 2-I-67, deposited at the USNM; Paratypes - 1 female and 1 male with same data as holotype, deposited at IZUCV; 1 female and 2 males ex *Rhipidomys macconnelli* (SVP 16046), same locality as holotype but 4-I-67; 1 female and 1 male deposited at MHNCM and 1 male at IZUCV; 1 male ex *Rhipidomys macconnelli* (SVP 16017), same locality but 1-I-67, deposited at FMNH; 1 female (SVP 16031), same host and data as above but 2-I-67; 1 male ex *Rhipidomys venezuelae* (SVP 15992), same locality as above but 1480 m elev., 30-I-67, deposited at ENCB; 1 female ex *Rhipidomys macconnelli* (SVP 15986), same locality as above but 1400 m elev., 29-I-67, deposited at IZUCV.

Amblyopinus waterhousei Fauvel

Amblyopinus waterhousei Fauvel 1900:64.—Machado-Allison and Barrera, 1964:176.—Barrera and Machado-Allison, 1968:98.

Machado-Allison and Barrera (1964) have reported the finding of this species in Venezuela (Estado Merida, La Mucuy, 2050 m, ex *Didelphis azarae*).

Venezuelan Records

One male ex *Didelphis azarae* (SVP 3950), Timotes, near Paramito, Merida, 3275 m elev., 9-II-66; 1 female and 3 males (SVP 3951), same locality and host but 3259 m elev., 1 female and 1 male ex *Didelphis azarae* (SVP 3961), 4 km W Timotes, Paramito, Merida, 3265 m elev.; 1 female and 1 male ex *Didelphis azarae* (SVP 4220), 6 km E Tabay (La Coromoto), Merida, 3155 m elev., 18-II-66. Specimens are deposited at the following institutions: IZUCV, ENCB, USNM, and FMNH.

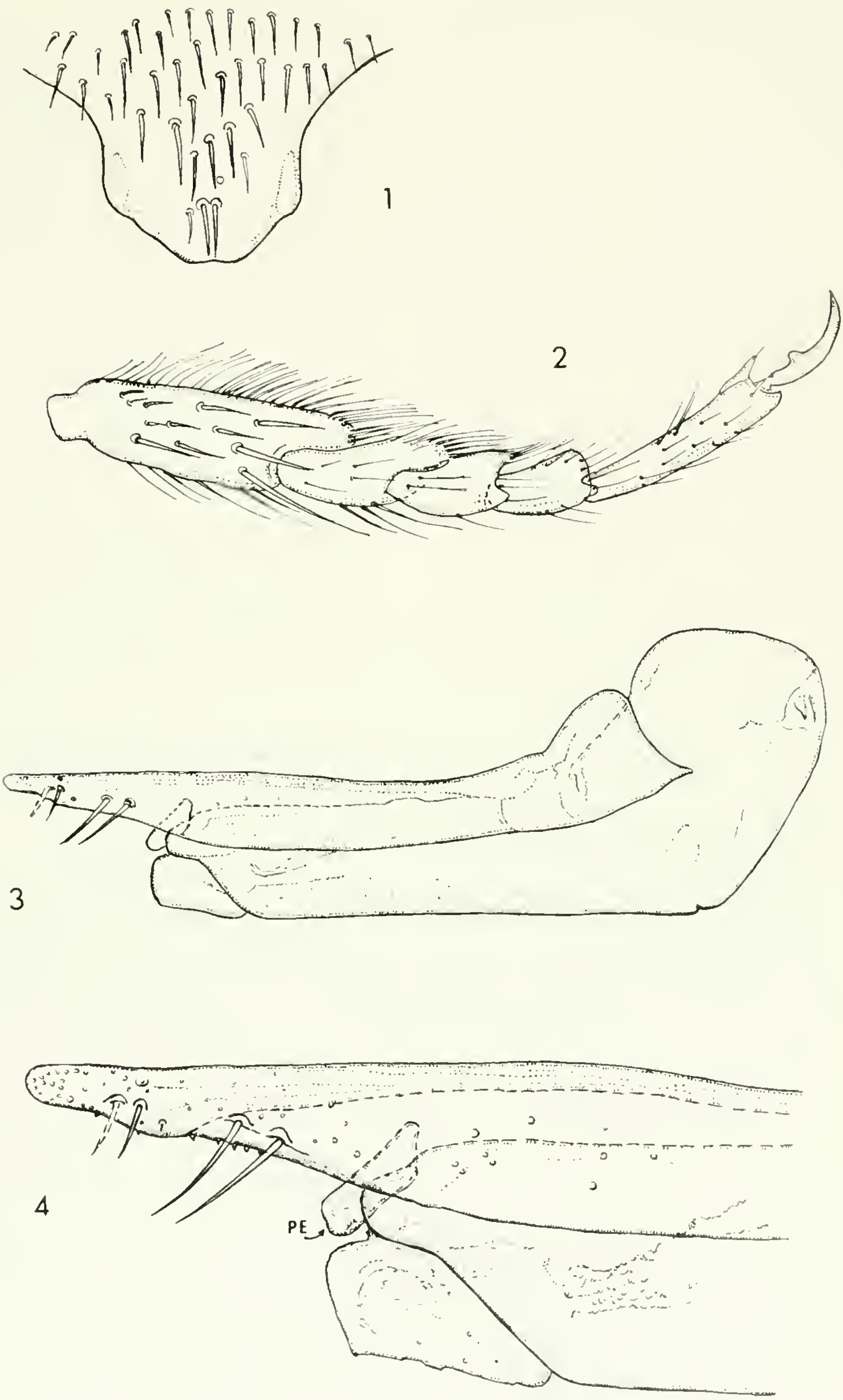


Fig. 1-4. *A. proximus,* new species, Holotype, male. 1, Metasternum; 2, Mesothoracic legs, tarsal segments; 3. Phallic organ; 4, Apex of parameres. PE = Sclerotized movable piece.

Amblyopinus metasternalis, new species

(Fig. 5-8)

DESCRIPTION

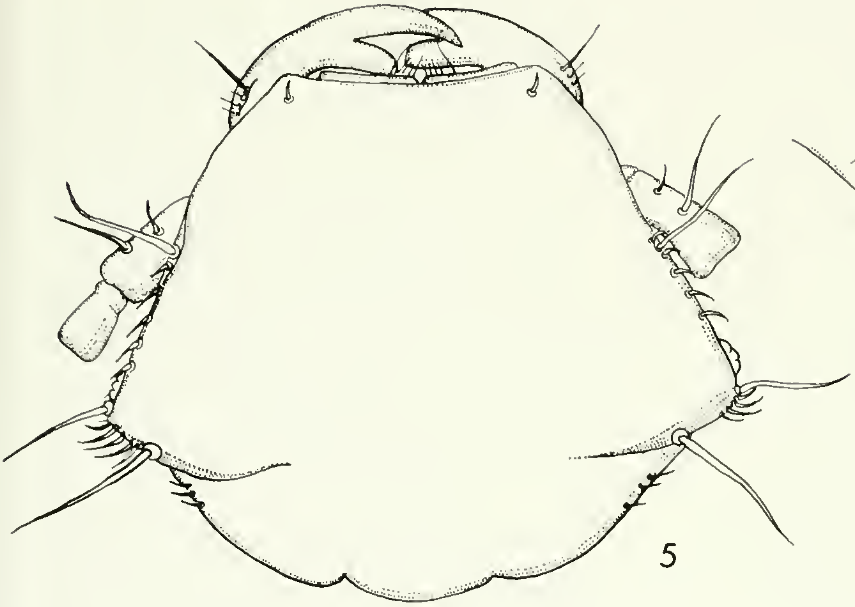
Relatively small and slender species; total length 7 to 8.5 mm.

MALE: General shape of head (Fig. 5) similar to *A. marmosae* Seevers, *A. bequaerti* Notman, and *A. henseli* Kolbe. Anterior margin of head concave with 1 short dark seta on each side close to external angle. Labrum small, with 7 long setae on each side, 1 longer, darker, 2 difficult to observe. Both margins of antennal groove with rows of 6 or 7 short but strong setae. Eyes small but with distinguishable facets. Supra- and subocular setae very long. Ocular margin with 6 or 7 short, strong setae. Mandibles with one row of setae on dorsal margin of basal sector, 1 very long. Antennae long, reaching posterior margin of pronotum. First antennal segment with 2 dark setae, 1 long, 1 shorter, both on dorsal surface. Submentum with two lateral grooves separated by small prominence, with 1 small seta on each side. Gula with posterior margin slightly concave, 1 long, several small setae on each side. Genae with 1 long, dark seta, many smaller setae on each side. *Thorax.* Lateral margins of pronotum with row of 7 or 8 short, curved setae plus 1 very long seta. Posterior margin with 6 (sometimes 7) long dark setae on each side; two setigerous points which can bear small, curved setae also present on each side. Elytra with dense pilosity of intermixed long and short setae, those of external angle of posterior margin particularly long. Basal third with row of 6 short, curved setae; this number apparently quite variable in species. Prosternum elevated, with 2 long, central setae plus about 20 smaller setae irregularly distributed. Mesosternum also elevated, wide and short with marked striation; mesosternal setae forming anterior row of 7 long dark setae plus another row of 3. In addition to larger ones, about 20 small apical setae and about 14 irregularly distributed setae on ventral surface. Metasternum (Fig. 6) extremely wide, characteristic for species, without sinus or with very shallow one; metasternal setae regularly distributed, increasing in size from center to posterior margin. Extreme posterior setae, however, almost reach margin. *Legs.* Prothoracic legs have modifications as in other species of genus as well as one long spiniform seta on posterior margin of ventral side of tibiae. In addition, 10 or 11 dorsal setae form a comblike row. Mesothoracic tibiae have strong spines on external margin, some spiniform setae intermixed with acicular setae on ventral surface. Mesothoracic tarsi somewhat modified but lacking dilatation observed in *A. emarginatus* or in species of *Amblyopinodes.* Metathoracic tibiae with long spiniform setae intermixed with short acicular setae; tarsi long, covered by acicular setae. *Abdomen.* Tergite II with long marginal setae, 2 short, strong, almost spiniform, setae close to external margin; 2 additional small dark curved setae, similar to those described on elytra and pronotum. Tergites III to VII with 1 long macroseta on each side; 2 additional small curved ones on third tergite; 2 submarginals, 1 marginal on fourth; 3 marginals, 1 submarginal on each side of seventh. Tergite VIII without macrosetae, however, with 14 short dark curved setae close to posterior margin. Sternites III and IV without long dark setae; V and VI with 1 marginal macroseta on each side; VII with 1 and VIII with deep sinus, 1 macroseta on each side. *Modified segments and genitalia.* Tergite IX with protruding posterior angles, posterior margin densely covered by acicular setae. Sternite IX with tergite forming tube through which phallic organ is ejected. Cerci strong, with both short and long setae on posterior half. Phallic organ (Fig. 7) with very large basal lobe. Parameres long, thin, heavily sclerotized, apex acuminate with long setae, few teeth on ventral margin. Movable sclerotized piece (Fig. 7, P.E., and Fig. 8) of characteristic shape.

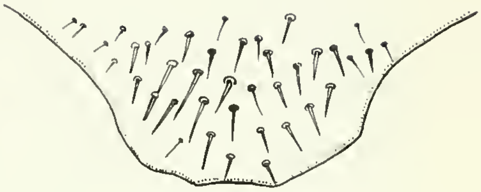
FEMALE: Chaetotaxy, in general, as in male. Ninth sternite wide, with long, slender setae; posterior margin convex, irregular. Gonapophysis of segment IX characteristic; valvifer wide, styli cuneiform, acute with preapical macrosetae thick, long, with 2 preapical setae of different length; internal margins covered by many small, slender setae; 6 short spiniform setae between apical and preapical macrosetae.

DIAGNOSIS

A. metasternalis, new species, is related to the other species of the *henseli* group (*henseli* Kolbe, *bequaerti* Notman, and *marmosae* Seevers). All are parasites of marsupials. Based on genital characters, *A. metasternalis* also seems to be related to *A. waterhousei* (*waterhousei* group of Seevers), another marsupial parasite. *A. metasternalis*, new species, can be separated from *marmosae* since it lacks the dentiform spine of the metathoracic tibiae; both species differ also in the chaetotaxy of the tergite VIII and sternites III to V as well as in the number of macrosetae of the posterior margin of the pronotum. From *bequaerti* and *henseli* the new species is readily distinguishable by its

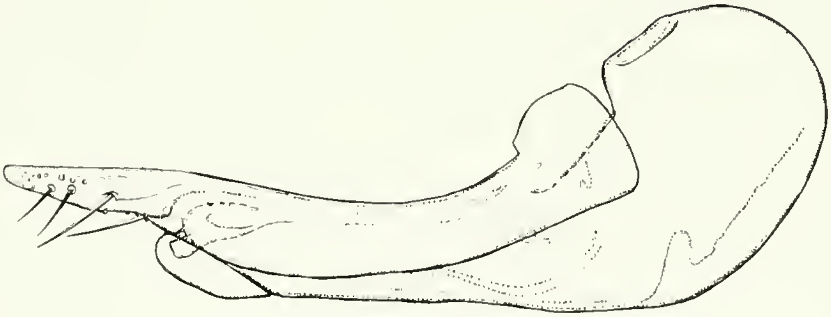


5



6

7



8

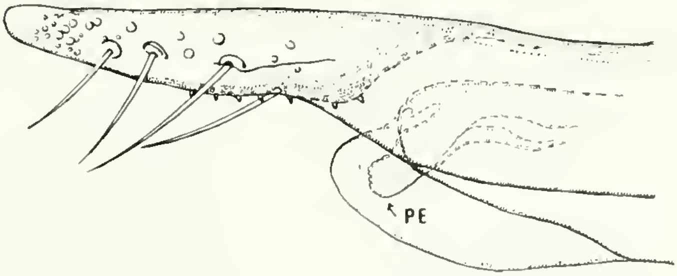


Fig. 5-8. *A. metasternalis,* new species, Holotype male. 5, Head, dorsal view; 6, Metasternum; 7. Phallic organ; 8, Apex of parameres.

larger size, facetation of the eyes, and the number of macrosetae of tergites, sternites, and pronotum. The differences have been established by comparing *metasternalis* with the types of all species of the *waterhousei* group, and with several specimens of *A. bequaerti*.

TYPE DATA: Male holotype and female allotype ex *Marmosa dryas* (SVP 3845), Trujillo State, 15 km E Trujillo, Hacienda La Misisi, 2360 m elev., 24-I-66, deposited at USNM; Paratypes - 1 female, same data as holotype, deposited at IZUCV; 1 male (SVP 3879), same data as above but 26-I-66; 1 female and 3 males (SVP 3891), same host and general locality as above but 14 km E Trujillo and 2210 m elev., 27-I-66, deposited as follows: 1 female, 1 male at MHNCM, 1 male at FMNH, 1 male at IZUCV.

Amblyopinus seeversi
(Machado-Allison and Barrera)

Megamblyopinus seeversi Machardo-Allison and Barrera, 146:179.

In a previous paper, we (Machado-Allison and Barrera, 1964) placed this Venezuelan species in the genus *Megamblyopinus* Seevers. The authors indicated that "*M. seeversi* n. sp., es provisionalmente incluída en el género *Megamblyopinus* Seevers por presentar el ángulo pósteroexterno de la cabeza prominente, los tarsos mesotorácicos no modificados y por la forma del órgano fálico. Sin embargo existen profundas diferencias entre *M. seeversi* y las otras dos especies conocidas del género." The finding of a second specimen of *seeversi* and the description of two new species, one from Venezuela and the other from Colombia (*A. trapidoi* Barrera and Machado-Allison), both of which have the postero-external angle of the head less prominent, as in *A. tiptoni* Barrera and *A. isabelae* Barrera and the phallic organ and tarsi similar to *seeversi*, allows us to establish the relationship among these four species. In addition, the shape of the movable sclerotized piece is common to this group of species. Such considerations allow us to place *seeversi* in the genus *Amblyopinus* and with other northern species (*trapidoi*, *isabelae*, *schmidti* and *tiptoni*) in the *jelskii* group of Seevers (1955).

Amblyopinus intermedius, new species

DESCRIPTION

MALE: *Head*. Labrum small, with abundant pilosity on internal margin, 6 longer setae on anterior margin; of these, 4th and 6th are longer. Posterolateral angles rounded, not as prominent as in *A. seeversi* (Machado-Allison and Barrera). Submentum wide, with anterior margin slightly concave, 1 long seta on each side, about 13 small setae on anterior one-third followed by 3-5 medial setae. Eyes large, prominent. Ocular margin with 6 or 7 stout setae. Antennal groove not very deep, with 8 or 9 setae on ventral margin. Antennae long, reaching posterior margin of pronotum; first antennal segment almost twice the length of second. Genae wide, covered with many setae, irregularly distributed, 1 larger seta on each side. Postgenal region narrow; posterolateral angles protruding less than in *A. seeversi*. *Thorax*. Anterior margin of pronotum with angles projected, slightly forward; posterior margin with 1 long, dark seta close to angle. Total length of pronotum equal to distance between anterior angles. Elytra as long as wide, covered by dense pilosity of mixed long and short setae. Prosternum elevated, with 2 long medial macrosetae, about 40 small setae of irregular distribution but more numerous near posterior and external angles. Mesosternum also elevated, with apex shorter, less deeply inserted between coxae than in *A. seeversi*. Chaetotaxy formed by 7 large setae plus 6 or 7 short setae; anterior margin slightly concave, lateral sides with regular convergence towards apex. Metasternum (Fig. 9) wide in its posterior margin, somewhat projecting posteriorly but without process which characterizes *A. seeversi;* sinus generally well developed, basal pilosity dense, formed by long acicular setae. *Abdomen*. Chaetotaxy of tergites II to VII as in *A. seeversi*, with 2 long dark setae on each side; VIII also as in *seeversi*, without long, dark setae. Sternites III, IV and V without macrosetae; VI with 1 on each side; VII with 2-3, 3-3 or 3-4 macrosetae on each side (2-2 in *seeversi*), VIII with 4 (sometimes 5 on each side of deep sinus. *Modified segments and genitalia*. Ninth tergite with deep sinus, concave, with numerous apical setae; cerci strong, with fine pilosity on entire surface, macrosetae on posterior two-thirds. Phallic organ (Fig. 11), in general, as in *A. seeversi*, with rounded apex, callus well developed, more prominent. Small sinus in ventral margin of parameres characteristic of species as is presence of three teeth instead of large one as in *seeversi*. Movable sclerotized piece (Fig. 12) with general shape of all species of *jelskii* group. Dorsal lobe of phallobase apex, rounded as in *A. proximus* Machado-Allison and Barerra.

DIAGNOSIS

A. intermedius, new species, belongs to the *jelskii* group of Seevers (1955) and is very

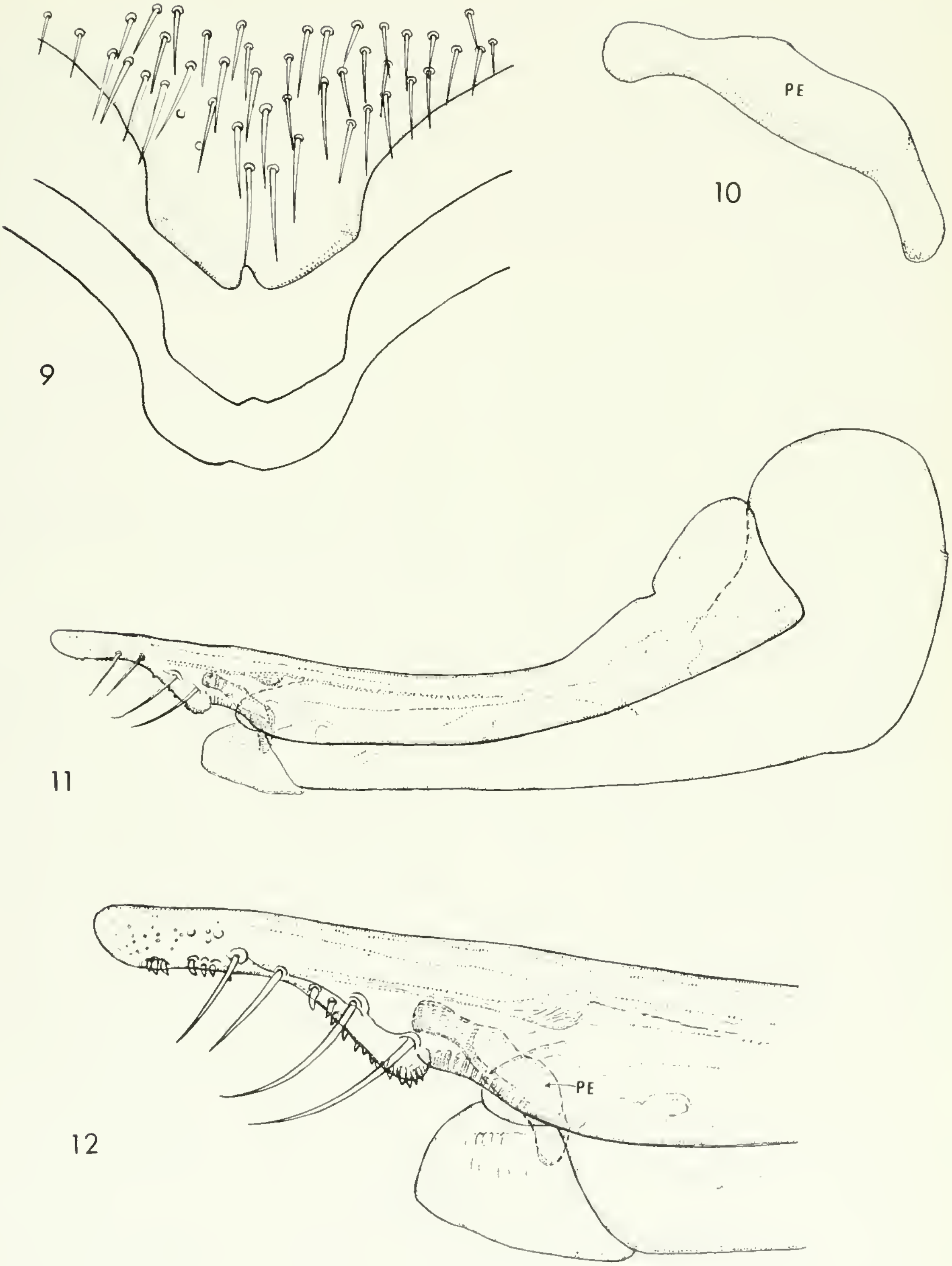


Fig. 9-12. *A. intermedius*, new species, Holotype, male. 9, Metasternum; variability in the shape of the posterior margin in Paratypes; 10. Sclerotized movable piece; 11. Phallic organ; 12. Apex of parameres.

closely related to *A. seeversi*. It is easily distinguishable from *A. schmidti* Seevers, *A. isabelae* Barrera, and *A. tiptoni* Barrera by the presence of 2 macrosetae on the posterior margin of tergites II to VII (there is only 1 in the previously named species) and the characters of the phallic organ. *A. intermedius* new species, is also distinguishable from *A. seeversi* (Machado-Allison and Barrera) by the shape of the metasternum, the chaetotaxy of sternite VIII of the male, and the shape of the phallic organ. Some details of the parameres and movable sclerotized piece are also of diagnostic value.

Type Data: Male holotype ex *Oryzomys minutus* (SVP 3844), Trujillo State, 15 km E Trujillo, Hacienda La Misisi, 2360 m elev., 22-I-66 deposited at USNM. Female allotype ex *Rhipidomys venustus* (SVP 3885), same general locality as above but 2210 m elev. Paratypes–1 male (SVP 3882), same data as preceding entry, deposited at IZUCV; 1 female ex *Rhipidomys venustus* (SVP 636), Distrito Federal, 9.4 km N Caracas, deposited at IZUCV; 1 male ex *Thomasomys laniger* (SVP 3816), Trujillo State, 15 km E Trujillo, Hacienda La Misisi, 2360 m elev., 18-I-66, deposited at MHNCM; 1 female ex *Rhipidomys venustus* (SVP 3884), same data as preceding entry but 2210 m elev., 26-I-66; 1 female ex *Rhipidomys venustus* (SVP 3850), same locality as preceding entry, deposited at FMNH; 1 male ex *Oryzomys minutus* (SVP 3990), Merida State, 3 km W Timotes, near Paramito, 16-II-66, deposited at FMNH. Other paratypes to be deposited in the mentioned collections are 1 female (SVP 3882), same data as allotype; 1 female ex *Rhipidomys venustus* (SVP 3894), same general locality as above but 28-I-66; 1 female ex *Thomasomys laniger* (SVP 4045), Merida State, 4 km S, 5 km E Tabay (La Coromoto), 11-III-66; 1 female ex *Oryzomys minutus* (SVP 4116), same general locality as above near La Coromoto, 3400 m elev., 15-III-66; 1 female ex *Oryzomys* sp. (SVP 4432), Merida State, 5 km E, 2 km S Tabay, 14-IV-66. The paratypes SVP 780 and SVP 874 have been deposited at the IZUCV; the first one, ex *Rhipidomys venustus*, Distrito Federal, 9.4 km N Caracas, 1394 m elev., 27-VIII-65; the second one, ex *Vampyrops oratus*, is probably a contamination.

Amblyopinus schmidti schmidti Seevers, new status

Amblyopinus schmidti Seevers, 1944:164 – 1955:231.–

A detailed analysis of the characters of this species and *A. bolivari* described from Mexico (Barrera, Machado-Allison, and Muñiz, 1960), based on specific characters of taxonomic value within related species (*isabelae, tiptoni, trapidoi, seeversi, and intermedius*, new species, together with the examination of specimens of *schmidti* from the type locality in Guatemala, has prompted us to conclude that *A. bolivari* is a subspecies of *schmidti*. The latter may be differentiated by minor characteristics of the phallic organ (movable sclerotized piece) and the arrangement of the ventral marginal teeth of the parameres.

Amblyopinus schmidti bolivari Barrera, Machado-Allison, and Muñiz, new status

A. bolivari Barrera, Machado-Allison, and Muñiz, 1960:127.

On the basis of the above-mentioned comments, we have reconsidered the status of this form and therefore classify it as a subspecies of *A. schmidti* Seevers.

Amblyopinus emarginatus Seevers

Amblyopinus emarginatus Seevers, 1955:239.

The presence in Venezuela of this interesting and abundant species, basically associated with the cricetine genus *Oryzomys*, was recorded for the first time by Machado-Allison and Barrera (1964) from the State of Aragua (Rancho Grande Biological Station) on *Oryzomys albigularis*. The species was also collected in the Serrania del Avila, D. F. at 2200 m. Many new records are presented in Table I.

Genus *Amblyopinodes* Seevers

Two new species of this genus are described below. Most of the described species of the genus *Amblyopinodes* have been collected in Brazil, Uruguay, Argentina, and Peru, from rodents of the family Cricetidae.

Amblyopinodes venezolanus, new species

(Fig. 13-16)

Description

Small species, 5.2 to 5.5 mm total length.

Male: *Head*. Clypeal setae small, dark. Labrum reduced, almost indistinguishable. Posterolateral angles of genal area well marked. Eyes very small, facetation almost imperceptible; ocular margin with 4 or 5 short, stout setae. Antennae relatively long, almost reaching posterior margin of pronotum; antennal groove

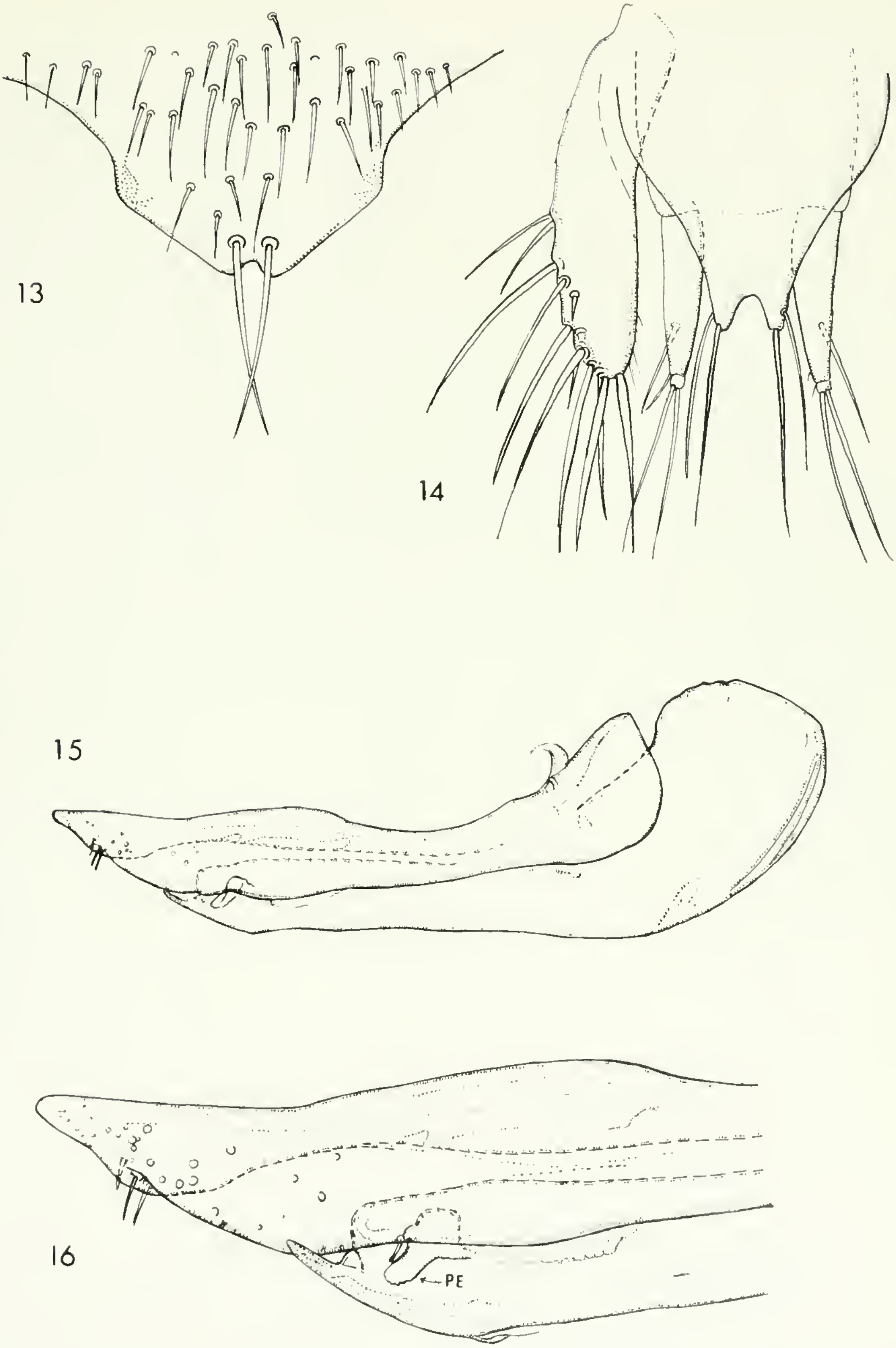


Fig. 13-16. *A. venezolanus,* new species. 13, Holotype male, metasternum; 14. Allotype female, tergite IX, coxites and cerci; 15. Holotype male, phallic organ; 16. Apex of parameres. PE = Sclerotized movable piece.

Table 1. New records on distribution and hosts of *Amblyopinus emarginatus* in Venezuela.

SVP°	Locality	Elevation in meters	Host	Date	Sex and no. specimens
190	Dto. Federal, 5 km N Caracas	1638	*Oryzomys albigularis*	24-VII-65	1 ♀
197	Dto. Federal, 1 km N Caracas	1495	*Oryzomys albigularis*	25-VII-65	1 ♀ and 1 ♂
344	Dto. Federal, 5 km N Caracas	1465	*Oryzomys albigularis*	29-VII-65	1 ♀
654	Dto. Federal, 9.4 km N Caracas	2223	*Oryzomys albigularis*	19-VIII-65	1 ♀ and 1 ♂
655	Dto. Federal, 9.4 km N Caracas	2223	*Oryzomys albigularis*	19-VIII-65	1 ♀
659	Dto. Federal, 9.4 km N Caracas	2194	*Oryzomys albigularis*	20-VIII-65	1 ♀
710	Dto. Federal, 9.4 km N Caracas	2238	*Oryzomys albigularis*	23-VIII-65	1 ♀ and 2 ♂♂
713	Dto. Federal, 9.4 km N Caracas	2232	*Oryzomys albigularis*	23-VIII-65	1 ♂
772	Dto. Federal, 9.4 km N Caracas	2232	*Oryzomys albigularis*	24-VIII-65	2 ♀♀ and 2 ♂♂
774	Dto. Federal, 9.4 km N Caracas	2264	*Oryzomys albigularis*	24-VIII-65	1 ♂
775	Dto. Federal, 9.4 km N Caracas	2190	*Oryzomys albigularis*	24-VIII-65	2 ♂♂
776	Dto. Federal, 9.4 km N Caracas	2187	*Oryzomys albigularis*	24-VIII-65	1 ♀
786	Dto. Federal, 9.4 km N Caracas	2095	*Rhipidomys venustus*	24-VIII-65	1 ♀
809	Dto. Federal, 9.4 km N Caracas	2166	*Oryzomys albigularis*	24-VIII-65	1 ♂
810	Dto. Federal, 9.4 km N Caracas	2147	*Oryzomys albigularis*	24-VIII-65	1 ♂
853	Dto. Federal, 9.4 km N Caracas	1281	*Oryzomys albigularis*	25-VIII-65	1 ♀ and 1 ♂
874	Dto. Federal, 3 km N Caracas	1394	*Vampyrops oratus*°°	27-VIII-65	1 ♀
995	Dto. Federal, 3 km N Caracas	2172	*Oryzomys albigularis*	27-VIII-65	1 ♂
2041	Aragua: Rancho Grande	1050	*Akodon urichi*	5-VIII-65	1 ♀
2057	Aragua: Rancho Grande	1050	*Oryzomys albigularis*	7-VIII-65	2 ♀♀ and 1 ♂
2081	Aragua: Rancho Grande	1050	*Oryzomys albigularis*	8-VIII-65	1 ♀
2087	Aragua: Rancho Grande	1050	*Oryzomys albigularis*	9-VIII-65	1 ♀
3735	Miranda: Petaquire, 20 km W Caracas	1970	*Oryzomys concolor*	22-XII-65	1 ♂
3416	Trujillo: near El Dividive, 30 km NW Valera	120	*Didelphis marsupialis*	19-X-65	4 ♀♀ and 5 ♂♂
3721	Miranda: Alto N. Leon, 20 km W Caracas	1780	*Oryzomys albigularis*	21-XII-65	2 ♀♀
3739	Miranda: Petaquire, 20 km W Caracas	1760	*Oryzomys albigularis*	23-XII-65	3 ♀♀ and 2 ♂♂
3749	Miranda. Petaquire, 20 km W Caracas	1760	*Bradypus infuscatus*	26-XII-65	2 ♀♀ and 3 ♂♂
3877	Trujillo: Hac. la Misisi, 14 km E Trujillo	2215	*Oryzomys albigularis*	26-I-66	1 ♀ and 1 ♂
3903	Trujillo: Hac. la Misisi, 14 km E Trujillo	2230	*Oryzomys albigularis*	29-I-66	1 ♂
3983	Merida: near Paramito, 3 km W Timotes	3127	host unknown	14-II-66	1 ♀
4428	Merida: 5.5 km E, 2 km S Tabay	2630	*Marmosa dryas*	14-IV-66	1 ♀
4494	Merida. 9 km E, 5 km S La Azulita (San Eusebio)	2190	*Oryzomys albigularis*	21-IV-66	1 ♂
4574	Merida: Santa Rosa	2020	*Oryzomys albigularis*	24-IV-66	1 ♀
5333	Aragua: Rancho Grande	1050	*Myotis nigricans*°°	28-IV-66	1 ♂
10388	Miranda: Curapão, 19 km E Caracas	1160	*Oryzomys albigularis*	1-X-66	3 ♂♂
13013	Miranda: Quebrada Chacaito 1 km E Caracas	1140	*Oryzomys albigularis*	14-V-68	1 ♂
13014	Miranda: Quebrada Chacaito 1 km E Caracas	1130	*Oryzomys albigularis*	14-V-68	5 ♀♀ and 1 ♂
13023	Miranda: Quebrada Chacaito 1 km E Caracas	1175	*Oryzomys albigularis*	15-V-68	3 ♀♀ and 2 ♂♂

°Smithsonian Venezuelan Project Field numbers
°°Probably a contamination

wide, deep, without setae on ventral margin. Submentum wide, with concave anterior margin, 6 small setae on each side, 2 innermost longer than others. Gula relatively short, with pair of macrosetae, very close to each other, about 10 small setae on each side of anterior one-third. Posterior margin of gula very narrow, with only one-third of distance between anterior angles of head. Posterior two-thirds of gula without setae. Posterior half of gena wide, with about 30 small setae on each side. *Thorax*. Pronotum with rounded anterior angles; posterior margin concave in middle, with 3 macrosetae on each side, outermost in angle. Total length of pronotum approximately one-half distance between posterior angles. Elytra as in other species of genus. Prosternum with anterior margin concave, 1 macrosetae, 11 or 12 small setae on each side. Mesosternum with anterior margin slightly convex; lateral margins regularly convergent, apex slightly projected between coxae, chaetotaxy formed by 7 long and 10 or 11 short setae. Metasternum wide, with shallow sinus, apex of most distal seta reaching apex as in *A. claviger* Franz. *Legs.* Prothoracic legs as in other species of genus. Mesothoracic legs short, densely covered by spiniform setae; tarsal segments I to III with dense ventral pilosity; V with 3 ventral setae on each side. Metathoracic legs long; tibiae with two spiniform, flattened spines on distal end, row of spiniform setae on external sides; tarsal segment V with 3 stout aciculate setae on each side of ventral surface, plus 2 spiniform setae. *Abdomen.* Tergite II with 3 or 4 macrosetae on each side as in *A. gahani* (Fauvel); III and IV with 2; V and VI with 1 marginal and 1 submarginal (1-1 - 1-1); VII with 2-1 - 1-1 and VIII with 2 on posterior margin and 3 submarginals on each side (2-3 - 2-3). Sternites III to V with claviform setae; VI with 2 marginal and 2 submarginal macrosetae; VIII with 6 or 7 setae on each side. *Modified segments and genitalia.* Ninth tergite with posterior margin concave, with 2 long setae, 1 marginal and 1 submarginal on each angle. Sternite IX small, densely covered by small acicular setae. Cerci short, wide, strong, as in *A. piceus* (Brethes), but much smaller. Phallic organ characteristic (Fig. 15) with parameres very elevated in preapical region, suddenly convergent to apex. Ventral setae of parameres short, distal pair very close to apex, widely separated from basal pair. Ventral margin of parameres with small teeth reduced in number. Movable sclerotized piece (Fig. 16) small, characteristic in shape, with margins at level of inner sac, very sclerotized, projected posteriorly, forming characteristic process.

FEMALE: Somewhat smaller but stronger than male. Chaetotaxy of tergites and sternites as in holotype. Cerci somewhat longer, slender. Coxites slender, very long, surpassing apex of cerci, with two long macrosetae, one apical and one subapical. Tergite IX deeply sinuated, with 1 long macroseta on each apical lobe (Fig. 14).

DIAGNOSIS

A. venezolanus, new species, is easily distinguishable from all other species of the genus by the characteristics of the phallic organ, chaetotaxy and shape of the tergite IX of the male and female. The chaetotaxy of the second tergite and the smaller size and coloration of this species seems to relate it to *A. gahani* (Fauvel).

TYPE DATA: Male holotype and female allotype ex *Akodon urichi* (SVP 8367), Bolivar State, 85 km SSE El Dorado, 1032 m elev., 18-V-66, deposited at USNM.

Amblyopinodes major, new species

(Fig. 17-19)

DESCRIPTION

Large, robust species, 10 mm in length, highly sclerotized.

MALE: *Head.* Labrum small, bilobed, with 6 or 7 small setae on each side. Eyes small, with facetation indistinguishable; ocular margin with 4 stout setae; in addition, 1 or 2 very small and inclinate setae. Antennal groove short, very wide, deep, without setae on ventral margin. Antennae relatively short, with first segment slightly longer than second. Submentum large, with anterior margin concave, 2 setae on each side, inner one longer than other. Gula with 2 large setae, 3 or 4 small setae of which anterior is larger than others as in *A. travassosi* Costa Lima and *A. piceus* Brethes. Genae wide, with about 35 small setae on each side. *Thorax.* Pronotum wide, large, with protruding anterior angles, numerous small stout setae on ventral side; distance between anterior angles equal to total length of pronotum. Posterior margin almost straight, with 4 large, dark setae on each side as in *A. piceus.* Elytra covered by uniformly long setae, with exception of some lateral longer setae. Prosternum large, with 2 characteristic macrosetae and 23 to 25 small setae on each side. Mesosternum triangular with anterior margin convex as in *A. guimaraesi* Machado-Allison and *A. adae* Machado-Allison; chaetotaxy consisting of 7 large and many short, feeble setae. Metasternum with sinus deep and setae limited to basal two-thirds (Fig. 17). *Legs.* Prothoracic legs as in other species of genus; first tarsal segment of mesothoracic legs very wide; tarsal segments I to III with dense pilosity on ventral surface; V with three pairs of strong setae. Metathoracic legs with strong ventral setae, four pairs on segment V, almost spiniform, plus 2 short, strong lateral setae. *Abdomen.* Tergite II with 3 long macrosetae on each side; III and IV with 2; V, VI and VII with 2 marginals, 1 submarginal (2-1 - 2-1); VIII with 1 or 2 marginals, 3 submarginals on each side. Sternites III to V with claviform setae, differing from *A. piceus* which also have such modified setae on sternite VI. Sternites VI and VII with 4 marginal and 2 submarginal macrosetae; sinus of VIII sternite very wide but not deep. *Modified segments and genitalia.* Posterior margin of

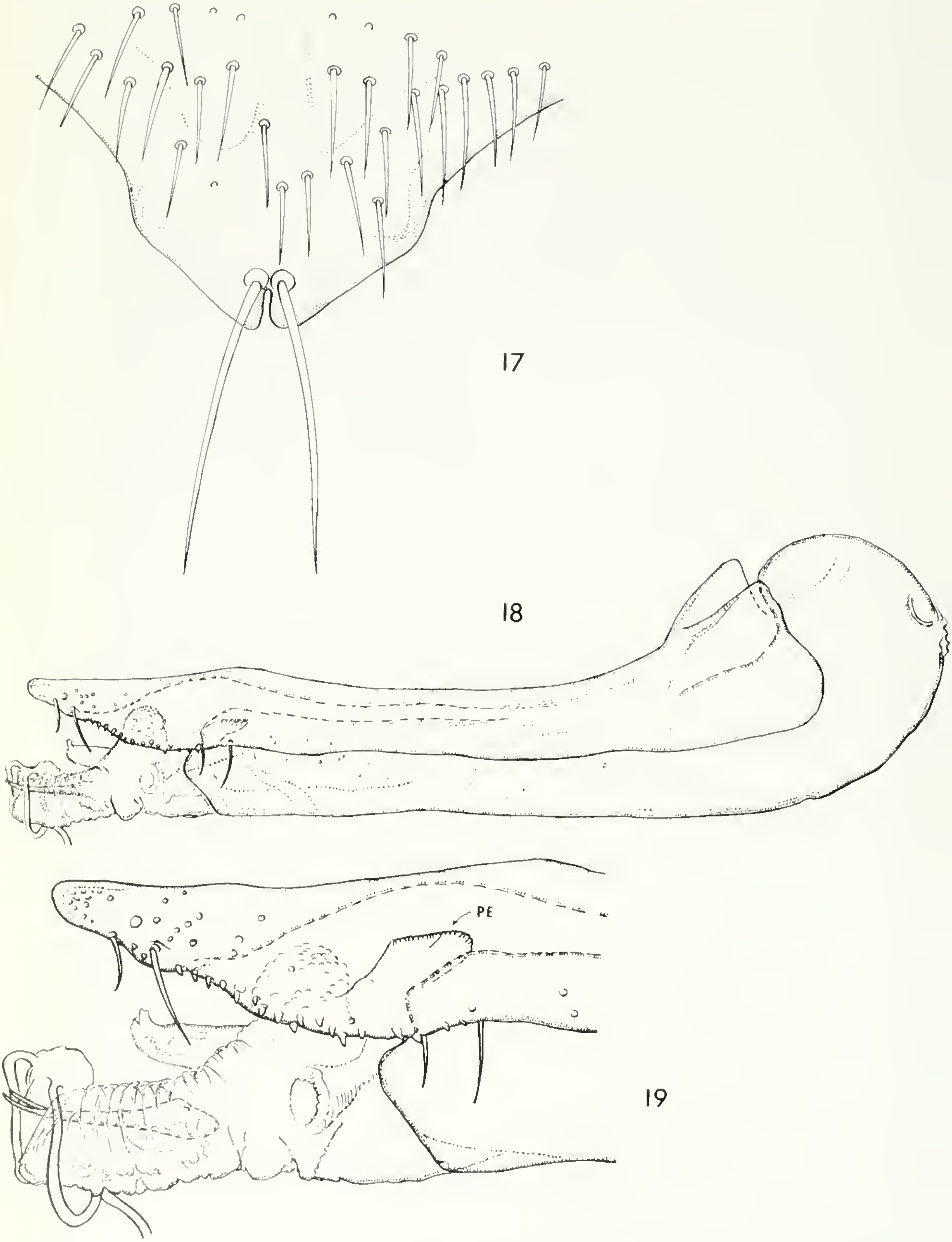


Fig. 17-19. *A. major*, new species, Holotype, male. 17, Metasternum; 18, Phallic organ; 19. Apex of parameres.

sternite IX straight, with long seta on each side. Phallic organ (Fig. 18) with long, sclerotized parameres, slightly widened at level of movable sclerotized piece; apex somewhat more rounded than in *A. piceus*. Ventral margin with numerous marginal and submarginal teeth of irregular arrangement and distributed from basal to apical pairs of setae. Movable sclerotized piece (Fig. 19) large, with apical margin widely striated, almost parallel margins.

Female not known.

Type Data: Male holotype ex *Proechimys guyannensis* (SVP 8007), Bolivar State, 85 km SSE El Dorado, 1032 m elev., 9-V-66, deposited at USNM; Paratype-1 male ex *Proechimys hoplomyoides* (SVP 8008), same locality as holotype, deposited at IZUCV.

Abbreviations

FMNH	Field Museum of Natural History, Chicago, Illinois, USA.
ENCB	Escuela Nacional de Ciencias Biológicas, IPN, México D.F., México.
MHNCM	Museo de Historia Natural de la Ciudad de México, México.
IZUCV	Instituto de Zoología Tropical, UCV, Caracas, Venezuela.
USNM	U.S. National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA.

SUMMARY

Five new Venezuelan species of Amblyopinini (Insecta, Coleoptera, Staphylinidae) parasitic on mammals are described. Eight species of the tribe are now known from Venezuela. The status of the Venezuelan species *Megamblyopinus seeversi* Machado-Allison and Barrera and the Mexican species *Amblyopinus bolivari* Barrera, Machado-Allison, and Muñiz are reconsidered. *M. seeversi* is transferred to the genus *Amblyopinus* and *A. bolivari* is considered to be a subspecies of *A. schmidti* Seevers. New data on distribution and hosts of *A. emarginatus* and *A. waterhousei* are also given.

The description of new species is based on specimens collected by the Smithsonian Venezuelan Project during the years 1965-1968. The following species of *Amblyopinus* are described: *A. proximus*, new species, related to the *jelskii* group but readily separated from species of that group by its feeble but enlarged mesothoracic tarsi and reduced pilosity on the ventral side of the first three tarsomeres; *A. intermedius*, new species, of the *jelskii* group, related to *A. seeversi* but readily differentiated by the shape of the metasternum and the phallic organ; *A. metasternalis*, new species, a characteristic species related to the *henseli* group by the shape of the head, but with the genitalia similar to species of the *waterhousei* group. Most of the species of both of these latter groups are parasitic on marsupials. Two new species of the genus *Amblyopinodes* Seevers are described: *A. major*, new species, related to *A. piceus* Brethes but distinguishable by the absence of claviform setae on sternite VI, and *A. venezolanus*, new species, which may be distinguished from all other species of the genus by emargination of tergite IX in both males and females.

RESUMEN

Se describen cinco nuevas especies venezolanas de Amblyopinini (Insecta, Coleoptera,, Staphylinidae) parasitas de mamíferos. Con ellas el número de especies conocidas para Venezuela se eleva a ocho. Además, se reconsidera el status de *Megamblyopinus seeversi* Machado-Allison y Barrera, 1964, descrito de Venezuela, para ser colocado en el género *Amblyopinus* Solsky y el de *Amblyopinus bolivari* Barrera, Machado-Allison y Muñiz, 1960, descrito de México, para ser considerado como una subspecie de *A. schmidti* Seevers, 1944. Por último, se ofrecen nuevos datos sobre la distribución de *Amblyopinus waterhousei* Fauvel y de *Amblyopinus emarginatus* Seevers.

La descripción de nuevas especies está basada en materiales colectados por personal de la Smithsonian Institution de 1965 a 1968 durante el desarrollo del Proyecto Smithsonian-Venezuela. Del género *Amblyopinus* son descritos *A. proximus*, especie nueva, relacionada con el grupo *jelskii* de Seevers, pero que se distingue por presentar las patas mesotorácicas con tarsos ligeramente ensanchados y escasa pilosidad plantar sobre los tres primeros; *A. intermedius*, especie nueva, del grupo *jelskii* y cercana a *A.*

seeversi, pero facilmente separable por la forma del metasternón y del organo fálico y *A. metasternalis* especie nueva, relacionada con otras especies parasitas de marsupiales, del grupo *waterhousei*, pero con una combinación de número de sedas sobre el margen posterior del pronoto que la separa de dichas especies y de las del grupo *henseli*. Del género *Amblyopinodes* Seevers, se describen *A. major*, especie nueva, cercana a *A. piceus*, pero facilmente separable de esta especie por carecer de sedas claviformes en el esternito VI, y *A. venezuelas*, especie nueva, que se distingue de las demás especies del género por tener el borde posterior del terguito IX emarginado.

LITERATURE CITED

Barrera, A. 1966. New species of the genus *Amblyopinus* Solsky from Panama and Mexico (Col.: Staph.). In *Ectoparasites of Panama, Field Museum of Natural History* Chicago, Ill. 281-288.

Barrera, A., C. Machado-Allison, and R. Muñiz. 1960. Un nuevo coleoptero parasito de roedores: *Amblyopinus bolivari* sp. nov. (Col.: Staph.). Ciencia (Mexico) 20(5-6):127-130.

Barrera, A. and C. Machado-Allison. 1965. Coleopteros ectoparasitos de mamiferos. Ciencia (Mexico) 23(5):201-208.

Barrera, A. and C. Machado-Allison. 1968. *Amblyopinus* de Colombia. Neotropica 14(45):89-98.

Machado-Allison, C. 1962. Sobre las especies brasileras, del género *Amblyopinodes* Seevers, 1955, con descripción de dos nuevas especies. (Col.: Staph.). Papeis Avulsos, Departamento de Zoologia 14(31):311-328.

Machado-Allison, C. 1962. Nuevos estafilinideos parasitos de roedores y clave para las especies del género *Amblyopinodes* Severs, 1955. (Col.:Staph.). Papeis Avulsos, Departamento de Zoologia 15(9): 81-90.

Machado-Allison, C. 1963. Revisión del género *Amblyopinodes* Seevers, 1955. (Col.: Staph.). Acta Biológica Venezuelica 3(25):371-416.

Machado-Allison, C. and A. Barrera. 1964. Sobre *Megamblyopinus, Amblyopinus y Amblyopinodes* (Col.: Staph.) Revista de la Sociedad Mexicana de Historia Natural 25:173-191.

Martínez, A., A. Barrera, and C. Machado-Allison. 1970. Sobre algunos *Amblyopinini* sudamericanos (Ins.: Col.: Staph.). Anales de la Escuela Nacional de Ciencias Biológicas 17:127-149.

Seevers, C. H. 1944. A new subfamily of beetles parasitic on mammals. Staphylinidae, Amblyopininae. Fieldiana: Zoology. Zoological Series of Field Museum of Natural History 28 (3):155-172.

Seevers, C. H. 1955. A revision of the tribe Amblyopinini: Staphylinid beetles parasitic on mammals. Fieldiana: Zoology. Zoological Series of Field Museum of Natural History 37:211-264.

LABIDOCARPID BAT-MITES OF VENEZUELA
(LISTROPHOROIDEA: LABIDOCARPIDAE)

by

Burruss McDaniel[1]

ABSTRACT

Nine species of bat-mites representing six genera of the family Labidocarpidae are recorded from Venezuela. The genus *Pseudoalabidocarpus* is described as new and contains a single species, *P. secus*, new species, collected from *Phyllostomus elongatus* and *P. discolor*. Two other new species are described: *Lawrenceocarpus phyllostomus*, new species, collected from *Phyllostomus elongatus* and *Micronycteris hirsuta;* and *Labidocarpus dossuarius*, new species, collected from *Molossus major*. New distribution and host records from Venezuela include: *Alabidocarpus furmani* on *Glossophaga longirostris, Carollia perspicillata, C. brevicauda, Vampyrops helleri, Anoura caudifera* and *Pteronotus parnellii; A. nicaraguae* on *Uroderma magnirostrum; A. jonesi* on *Vampyrops helleri; Parakosa tadarida* on *Noctilio labialis, Glossophaga longirostris, Carollia brevicauda, Sturnira lilium, Molossus ater* and *Molossus bondae; Parakosa maxima* on *Noctilio labialis, Glossophaga longirostris, Artibeus harti, Molossus ater, M. bondae* and *M. major.*

INTRODUCTION

The first labidocarpid bat-mite recorded from the neotropical realm was collected in Mexico by McDaniel in 1962. Since that date several records of bat-mites have been established from Trinidad (Pinichpongse, 1963 *b,c,d*), Cuba (Dusbàbek and Cruz, 1966), Nicaragua (McDaniel, 1970), and Venezuela (Fain, 1970). The latter work by McDaniel (1970) listed additional records from Puerto Rico, Peru, Ecuador, and Venezuela.

Information is almost nonexistent on species of the family Labidocarpidae that occur in South America. The present work is based on a collection made by personnel under the direction of Doctors Vernon J. Tipton, Professor of Zoology, Brigham Young University, and Charles O. Handley, Jr., Curator of Mammals, U. S. National Museum of Natural History, Smithsonian Institution, with the aid of Department of the Army contract DA-40-193-MD-2788 (Ecology and distribution of mammalian ectoparasites, arboviruses, and their hosts in Venezuela).

SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTION

Genus *Alabidocarpus* Ewing

Alabidocarpus Ewing, 1929:188.—Pinichpongse, 1963*b*:266.—McDaniel, 1970:804. — McDaniel and Coffman, 1970:223.

Type Species: *Labidocarpus megalonyx* Trouessart, 1895, ex *Rhinolophus ferrum-equinum.*

Alabidocarpus furmani Pinichpongse

Alabidocarpus furmani Pinichpongse, 1963*b*: 273.—McDaniel, 1970:804.

Redescription

Male: Body laterally compressed with numerous (40±) fine annulations; skin unsclerotized except for gnathosoma, anterior propodoso-

---

[1] Entomology-Zoology Department, South Dakota State University, Brookings, South Dakota 57006

mal plates, coxal apodemes and opisthosomal plate. Legs I and II highly modified, usual labidocarpid type, i.e., with plates flaplike, dilated distally, adapted for fitting around hair of host. Propodosomal shield well developed, extends to level of leg II with 2 pairs microsetae posterior to propodosomal shield. Setae located near coxa III unequal in size, dorsal pair much larger and longer than ventral pair, ventral pair similar in size and shape to propodosomal setae. Leg III with main single claw shorter than main claw of leg IV, longer than accessory spurs; 2 accessory spurs shorter than accessory spur of leg IV, subequal in size, both with furrowed inner surface, knifelike, with saw-toothed apex. Two prominent setae located on tibia. Leg IV with main claw thicker at base than base of main claw of leg III, longer and curved, with 1 accessory spur. Two prominent setae located on posterior side of last and next to last segments of leg IV. One pair of setae associated with and enclosed within apodemes of legs III and IV. Two pairs setae associated with flaplike clasping portion of legs I and II. Pair located nearest body larger than pair on outer edge of flap. Anal region of body with pair of small anal suckers. Two pairs anal setae, dorsal pair longer than opisthosomal region of body, ventral pair small, located below dorsal pair. Opisthosomal region sclerotized, forms opisthosomal plate. Anal suckers associated with plate. Length (allotype) 645 μ (592-671), width 300 μ (275-336), (measured between legs III and IV).

FEMALE: Body laterally compressed with numerous (74±) fine annulations posterior to propodosomal shield. Legs I and II modified as in male. Legs III and IV with same type of main tarsal claws and accessory spurs as male. Propodosomal shield similar to male, 2 pairs minute setae posterior to propodosomal shield, also 1 pair of setae similar in structure on mid-dorsum at level between legs III and IV (these not present on male). Two pairs lateral setae just dorsal to coxa III; dorsal pair long, ventral pair minute. One pair of setae between lateral setae and dorsal margin. One pair of setae between coxae III and between coxae IV, associated with apodemes similar to male. Opisthosoma without opisthosomal plate, with pair of anal setae. Legs I and II with same type setae as male. Legs III and IV subequal, without setae on tarsus IV, with setae on penultimate segment. Length (holotype) 830 μ (653-903), width 345 μ (305-390 measured between legs III and IV).

VENEZUELAN RECORDS

Two females, 1 copulatory female, 1 male ex *Glossophaga longirostris* (SVP 5588), Apure, 46 km NE Puerto Paez, Hato Cariben, Río Cinaruco, 76 m elev., 9-XII-65; 3 females, 1 male, 1 nymph, host (SVP 5812), and data as above except 23-XII-65; 7 females, 1 copulatory female, 1 male, hosts (SVP 6261 and 6301) as above, Apure, 38 km NW Puerto Paez, Río Cinaruco, 76 m elev., 19-I-66; 1 female ex *Carollia perspicillata* (SVP 15732), T. F. Amazonas, Río Cunucunuma area, Belén, base of Cerro Duida, 150 m elev., 15-I-67; 2 females, host (SVP 30357) as above, T. F. Amazonas, 32 km SSE Puerto Ayacucho, Raya I, 3 miles SE Coromoto, 135 m elev., 6-IX-67; 1 female, ex *Carollia brevicauda* Carabobo, 9 km NE Montalbán, Cumbre Canoabo, 1245 m elev., 1-XI-67; 2 females, 1 female with hexapod nymph within body, 1 hexapod nymph ex *Vampyrops helleri* (SVP 26828 and 26850), T. F. Amazonas, clearing in front of Catholic Mission, San Juan, Río Manapiare, 155 m elev., 17-VI-67; 1 female, 1 copulatory female, 1 male ex *Anoura caudifera* (SVP 15841), T. F. Amazonas, 6 km SE Belén, Cerro Duida, Cano Culebra, 700 m elev., 16-I-67; 1 female, 1 male ex *Pteronotus parnellii* (SVP 20641), Yaracuy, 8 km N and 18 km W San Felipe (Minas de Aroa), 380 m elev., 18-XII-67.

REMARKS

This species was first recorded from Trinidad from *Anoura geoffroyi geoffroyi*. Additional records by McDaniel (1970) extended its distribution to include Mexico and Nicaragua. The records here extend the distribution of *A. furmani* to include South America and adds the following as new host records: *Glossophaga longirostris*, *Carollia perspicillata*, *C. brevicauda*, *Vampyrops helleri*, *Anoura caudifera* and *Pteronotus parnellii*.

Alabidocarpus nicaraguae McDaniel

Alabidocarpus nicaraguae McDaniel, 1970:804.

REDESCRIPTION

MALE: Body laterally compressed with numerous (37±) fine annulations; skin transparent except for gnathosoma, propodosomal plate, opisthosomal plate, and coxal apodemes of all legs. Legs I and II usual labidocarpid type. Legs III and IV four-segmented. Leg III shorter and thicker than leg IV; with single main claw larger than accessory spurs, slightly curved throughout length, more acute at apex; 2 accessory spurs, shorter and thicker than main claw with inner surface furrowed; outer accessory spur thicker and longer than inner accessory spur, both broad at base, narowed toward apical end like those of *A. jonesi* McDaniel, knife-shaped with furrowed cutting edge; without large seta at base of main claw between main claw and inner accessory spur; two large subequal setae on tarsus, 1 on ventral surface, 1 on dorsal surface, both near pseudo-articulation of tarsus and claws; dorsal setae curved, ventral setae straight (Fig. 1). Leg IV tarsus (Fig. 1), with single main claw, curved, much longer than main claw of leg III, thicker than *A. jonesi* main claw, curvature more acute at apex than on *A. jonesi;* one accessory spur, much longer than accessory spurs of leg III, inner edge furrowed, margin parallel to distal portion, distal portion narrowed with rounded apex; accessory spur approximately same width and size as main claw of leg III; much broader and thicker than same accessory spur of *A. jonesi;* 1 large slender seta below pseudoarticulation of tarsus and claws; seta as long as main claw, origin same as that of accessory spurs; 1 large seta on dorsal surface of tarsus above and adjacent to pseudoarticulation, similar in shape to same seta on leg III; one small seta at anterior dorsal portion of tarsus; 2 pairs long, slender setae on apodemes of coxa IV. Gnathosoma short, adapted for clasping hair, palpi with recurved teeth (Fig. 1). Chelicera base extends to apodeme of leg I, expanded basally and terminates apically in two digits bearing teeth. Propodosomal plate extends to coxa II without lateral pointed projection as associated with male of *A. jonesi.* Three pairs minute setae posterior to propodosomal plate, lateral setae typical *Alabidocarpus* type, i.e., posterior pair long, extends to coxa IV; anterior pair minute, similar in structure to minute dorsal setae. Anal region with pair of anal suckers (Fig. 2), three pairs anal setae, center pair well-developed, extend beyond longitudinal slit, other 2 pair short (Fig. 1). Sclerotized plate of anal area covers opisthosomal region. Other body setae as shown in Fig. 1. Length 0.442 mm, width 0.256 mm (measured between legs II and III).

Female: Body laterally compressed as in male, with numerous (55±) fine annulations; skin transparent as in male, without sclerotized opisthosomal plate. Legs I and II modified as in male. Legs III and IV with same type main claw and accessory spurs as male. Leg IV longer and thinner than leg III, similar to male except not as long (Fig. 2); tarsus with single main claw, larger than accessory spur, slightly curved throughout length; more acute at apex, with seta between claw and accessory spur, base below pseudoarticulation of tarsus and claws; accessory spur long and thin, longer than accessory spurs of leg III, inner edge furrowed, margin parallel to distal portion, distal portion narrows to rounded apex; accessory spur thinner than same spur on male; large seta on dorsal surface of tarsus similar to that found on male. Leg III similar to male leg III. Two pairs setae between coxal apodemes of leg III. Gnathosoma similar to male, longer, adapted for clasping hair, palpi with recurved teeth (Fig. 2). Chelicerae similar to male. Propodosomal plate similar to male without lateral pointed projections. Minute setae similar in structure and location as male; lateral setae same as male; pair of minute setae similar in structure to propodosomal setae, placed above coxa IV on dorsal portion of body. Opisthosomal region without sclerotized plate, bears two large anal setae each associated with pair of minute setae similar to propodosomal setae. Other body setae shown in Fig. 2. Length 0.419 mm, width 0.233 mm (measured between legs II and III). *Copulatory female—Early Stage.* Body oval without evidence of formation within puparium; annulations 28±, many not extending whole width of body. Hysterosoma without annulations except at ventral regions where annulations present but not extending to dorsal portion of body. Anal area of body with annulations (5± in number) with single pair of setae. Hysterosomal region sclerotized without annulations.[2] Puparium without winglike projections. Four pairs spined papillae; first and second pair with 3 spines, unequal in length; third pair with 4 spines; fourth pair with 1 large spine with 2 setae. Length 0.326 mm, width 0.29 mm (measured between papillae II and III). The size of this species' puparium may vary greatly due to the stage of development. *Copulatory Female—Late Stage.* Body egg-shaped with fully-formed female within puparium; annulations 38±, many not extending whole width of body (Fig. 3). Hysterosomal region of puparium without annulations or winglike projections. Four pairs spined papillae; first and second pair with 3 unequal spines (Fig. 3); third pair with 4 pair unequal spines; fourth pair with 3 pair of spines, 2 large, 1 short and thick (Fig. 3). Females observed in Venezuelan material have the same tarsal claw and spur arrangement on leg III and the same minute setae, shape of propodosomal plate, recurved teeth on palpi, and setae as mature females. Length 0.442 mm, width 0.256 mm (measured between papillae II and III).

Hexapod Larva: Body laterally compressed with numerous annulations (32±); skin transparent except for same areas sclerotized in female. Legs I and II modified for clasping hair as in adults. Leg III with same type claw, spurs, and tarsal setae as in female. Pair of well developed setae between 2nd and 3rd pair legs. Gnathosoma short; palpi with recurved teeth similar to female and male. Chelicerae similar to female, functional, expanded basally, terminate in 2 digits bearing teeth. Propodosomal plate present, similar in shape and structure to female with same associated minute setae. Lateral setae same as female. Hysterosomal region without annulations with winglike structures for clasping male. Anus similar to female; 1 pair anal setae. Other body setae shown in Fig. 4. Length 0.372 mm, width 0.186 mm, measured between legs II and III).

---

[2] This raises the question that this may be related to the male rather than the female due to the presence of a sclerotized opisthosomal plate found only on males of this species. However, stages are known to be attached to the mature males.

Diagnosis

Alabidocarpus nicaraguae McDaniel is most closely related to *A. jonesi*, but differs from it in larger size; absence of pointed lateral projections of the propodosomal plate; the size of leg IV, which is more acute at the apex; and accessory spur of leg IV which is much broader and thicker.

Type Data: Male holotype ex *Uroderma bilobatum molaris* (KU-110985), Santa Rosa, 17 km N, 16 km E Boaco, Nicaragua, 300 m elev., 9-VIII-67, collected by James D. Smith (JDS-3355).

Venezuelan Records

Three females, 2 copulatory females, 3 males, 2 nymphs ex *Uroderma magnirostrum* (SVP 18463 and 18465), T. F. Amazonas, Tamatama, Río Orinoco, 135 m elev., 1-V-67; 1 female, 1 copulatory female, 2 males, host (SVP 18570), and data as above except 2-V-67.

Remarks

This is the second record of this species. Its original distribution was from Nicaragua from *Uroderma bilobatum molaris*. This extends the range of *A. nicaraguae* to include South America. This species to date is restricted to the host species *U. bilobatum* and *U. magnirostrum*. McDaniel (1970) stated that the female allotype possibly was not fully mature. However, in a comparison of material collected from Venezuela, the allotype contains all those structures of specimens known to be fully mature.

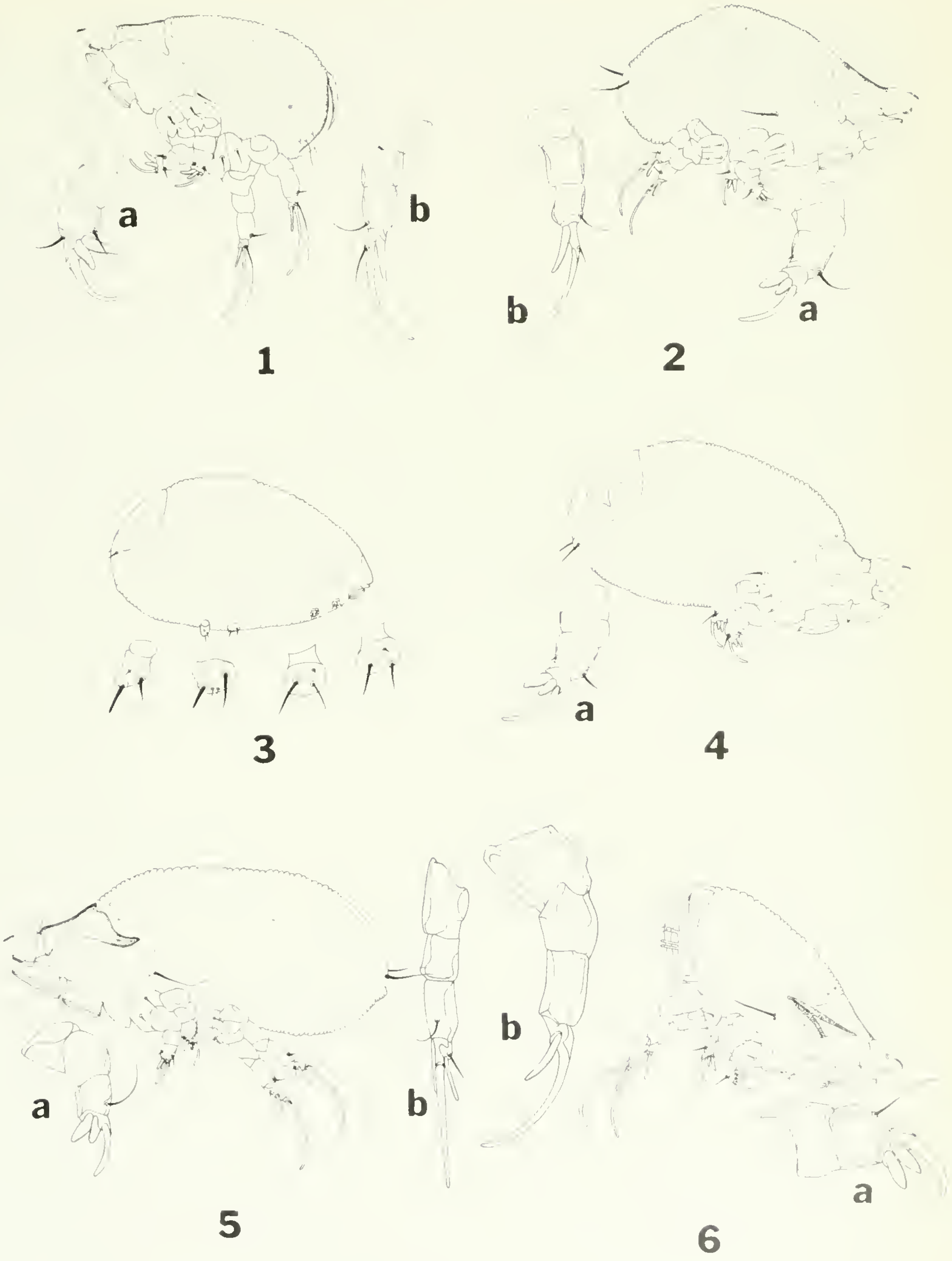
Alabidocarpus jonesi McDaniel

Alabidocarpus jonesi McDaniel, 1970:804.

Redescription

Female: Body laterally compressed with numerous (40+) fine annulations; transparent except for gnathosoma, anterior propodosomal plate, and coxal apodemes of all legs. Legs I and II highly modified, of usual labidocarpid type, i.e., plates flaplike, dilated distally, of equal size, adapted for fitting around hair of host. Legs III and IV four-segmented, leg III shorter and thicker than leg IV with single main claw larger than accessory spurs, slightly curved at distal end; 2 accessory spurs shorter and thicker than main claw, inner surface furrowed; outer accessory spur thicker and longer than inner accessory spur, both broad at base, narrow toward apical end, and knife shaped with furrowed cutting edge; with large seta at base of main claw, between main claw and inner accessory spur; 2 large setae on tarsus, one ventral, one dorsal, both near pseudoarticulation of tarsus and claws; dorsal setae longer and larger than ventral ones. Leg IV much longer than leg III (Fig. 5), tarsus with single main claw curved, much longer and slimmer than main claw of leg III; 1 accessory spur much longer and thinner than either accessory spurs of leg III, with inner edge lightly furrowed, broad at base, tapers to blunt apex; length much shorter than main claws of leg IV, nearly as long as main claws of leg III (Fig. 5); 1 large seta on dorsal surface of tarsus near pseudoarticulation of tarsus and claws; 1 small seta at anterior dorsal portion of tarsus; 2 pairs long, slender setae on apodemes of coxae IV; base of main claw with small spinelike projection behind claw base extending dorsally beyond claw base (Fig. 5). Gnathosoma short, palpi with recurved teeth (Fig. 5). Chelicerae approximately as long as gnathosoma, slightly expanded basally, terminate apically in 2 digits bearing teeth. Propodosomal plate extends slightly beyond coxa of leg II, with pointed lateral projection extending to coxa of leg III (Fig. 5). Two pairs of minute setae posterior to propodosomal plate, another similar pair just below and posterior to lateral projections of propodosoma. Two pairs of lateral setae just above apodemes of leg III, posterior pair well-developed, extend beyond apodemes of leg IV; anterior pair similar to minute setae near propodosomal plate. Other setae as shown in Fig. 5. Anus a longitudinal slit, bounded by a pair of large anal setae and a pair of minute setae. Length of female 0.533 mm, width 0.233 mm (measured between legs II and III). *Copulatory Female.* Body egg shaped with fully formed female within puparium; in some specimens annulations 32+, many not extending whole width of body (Fig. 7). Hysterosomal region of puparium without annulations or winglike projections. Four pairs of spined papillae; first and second pairs with 2 spines, unequal in length; third and fourth pairs with 4 and 3 respectively (Fig. 7). Mouth parts absent or rudimentary. Female within puparium resembles mature female, has same tarsal claw and spur arrangement on legs III and IV. Length 0.372 mm, width 0.209 mm (measured between second and third spined papillae).

Male: Body laterally compressed as in female, numerous (27+) fine annulations; skin



Figs. 1-6. (1) *Alabidocarpus nicaraguae* McDaniel, Male, a. leg III, b. leg IV. (2) *Alabidocarpus nicaraguae* McDaniel, Female, a. leg III, b. leg IV. (3) *Alabidocarpus nicaraguae* McDaniel, copulatory female. (4) *Alabidocarpus nicaraguae* McDaniel, Nymph, a. leg III. (5) *Alabidocarpus jonesi* McDaniel, Female, a. leg III, b. leg IV. (6) *Alabidocarpus jonesi* McDaniel, Male, a. leg III, b. leg IV.

transparent except for anterior gnathosoma, propodosomal plate, coxal apodemes and opisthosomal plate. Legs I and II modified as in female. Legs III and IV with same type main tarsal claw and accessory spurs as female and same large setae associated with claw and spurs. One large seta on dorsal surface of tarsus near pseudoarticulation of tarsi and claws. Leg IV longer and thinner than leg III, similar to female except not as long (Fig. 6); tarsus with same type main claw, accessory spur and large setae on dorsal surface as female. Gnathosoma similar to female only shorter; palpi with recurved teeth (Fig. 6). Chelicerae similar to female. Propodosomal plate similar to female except with longer lateral projections extending beyond lateral setae. Two pairs minute setae between lateral projections posterior to propodosomal plate, another pair minute setae at apical end of propodosomal plate lateral projections. Lateral setae as on female, dorsal pair extend beyond coxa IV. Anal region of body with pair of anal suckers (Fig. 6); three pairs anal setae, dorsal pair long, other 2 pairs short. Sclerotized plate of anal area covers opisthosomal region of male. Other body setae shown in Fig. 6. Length 0.395 mm, width 0.186 mm (measured between legs III and IV).

Larva: Body laterally compressed with numerous (22±) annulations; skin transparent except for same area sclerotized in female. Legs I and II modified for clasping hair as in female and male. Leg III with same type claw, spurs and tarsal setae as female. Setae associated with leg III coxal apodemes absent. Gnathosoma short; palpi with recurved teeth similar to adult (Fig. 8). Chelicerae approximately as long as gnathosoma, functional, expanded basally as in mature forms, terminates in two digits bearing teeth. Propodosomal plate present, but without lateral projections. Two pairs minute setae posterior to plate as in mature forms; similar pair located between lateral setae and minute dorsal setae. Lateral setae similar to male and female, posterior pair long, extend beyond coxa III; anterior pair minute, same type as dorsal setae. Hysterosomal region without annulations, with pair of round glandularlike structures for clasping male. Anus similar to female, 1 pair anal setae. Other body setae shown in Fig. 8. Length 0.302 mm, width 0.140 mm (measured between legs II and III).

Type Data

Female holotype ex *Vampyrops helleri* (KU-111027) km N, 2.5 km W, Villa Somoza, Chontales, Nicaragua, 5-VIII-67, collected by J. Knox Jones, Jr. (JKJ-5240).

Venezuelan Records

Two females ex *Vampyrops helleri* (SVP 26818), T. F. Amazonas, clearing directly in front of Catholic Mission, San Juan, Rio Manapiare, 155 m elev., 17-VII-67.

Remarks

Alabidocarpus jonesi McDaniel is most closely related to *Alabidocarpus nicaraguae*. Compared with previously described species of *Alabidocarpus*, these two species differ in the elongated fourth pair of legs, shape and size of the claws, and spurs on leg IV. *A. jonesi* has been recorded only from its type host *Vampyrops helleri*. This extends its distribution to include South America.

Genus *Parakosa* McDaniel and Lawrence

Parakosa McDaniel and Lawrence, 1962:463.

McDaniel (1970) believed that with additional host collections members of this genus would be found throughout the Americas. Records included in this paper extend the known range from Nicaragua to Venezuela. The genus is characterized by a spine in addition to spurs on legs III and IV, and by a wide range of intraspecific size variation.

Type Species: *Parakosa tadarida* McDaniel and Lawrence, 1962, ex *Tadarida laticaudata yucatanica*.

Parakosa tadarida McDaniel and Lawrence

Parakosa tadarida McDaniel and Lawrence, 1962:146.—McDaniel, 1970:804. — McDaniel and Coffman 1970:233.

Redescription

Female: Body laterally compressed, oval-shaped with numerous fine annulations; skin transparent except for anterior head plate and coxal apodemes of legs. Legs I and II highly modified, of usual labidocarpid type, i.e., with plates flaplike, dilated distally, of equal size. Front legs used to clasp hairs of host. Legs III and IV anterior to midline of body. Leg IV removed from posterior portion of body by at least three times its length. Head plate with two lateral projections beset with minute pores (Fig. 9). Apodeme of leg I obscures anterior portion of head plate. Gnathosoma not clearly delineated, not produced into sharp point as on *Alabidocarpus* and *Labidocarpus*, rather short and blunt with rounded lobes on upper surface. Two stout setae on each side posterior

---

[1] Due to complexity and small size of gnathosoma, details of this structure have been difficult to ascertain

to head plate, upper subequal to lower, near base of leg I apodeme. Subequal pair of long setae above coxa III, insertions similar to those posterior to head plate. Legs III and IV with four segments, apodemes connected (Fig. 9). Coxae expanded into elongate pyramid, connected to fused apodemes. Leg III stouter than leg IV, with 3 tarsal spines; single main claw long and curved, with two shorter, straight accessory spurs; large triangular-shaped spine at base of main claw, removed from accessory spurs. Leg IV longer, coxa smaller, segments more elongate than leg III; single main claw curved, length exceeding main claw of leg III, curved portion more concentrated at apex; single accessory spur and base of main claw separated by triangular spine similar to leg III. A pair of small hairlike setae between coxae III and IV. Approximately 50 annulations interrupted at posterior section, not plainly visible at anterior end. Dorsal surface annulations appear as distinct ripples (Fig. 9). Anus a longitudinal slit bounded by 2 pairs of large, thick anal setae of equal size and length, similar to those of anterior part of body. Length of female 0.992 mm. *Copulary Female.* Body egg shaped as in mature female, without well-developed legs and gnathosoma (Fig. 10b). Two pairs large thick setae posterior to mature female's head plate, well developed in copulatory female. Two pairs setae near coxa III well developed. Gnathosoma and legs I and II indicated by sclerotization. Legs III and IV indicated by small humps and presence of large setae where coxae III will be formed. Body with series of annulations extending from anterior to posterior of body, interrupted at anal section to form a V.

Male: Body laterally compressed as in female, oval shaped, much more reduced than female; legs III and IV posterior to midline; leg IV extends beyond posterior end; numerous annulations; skin transparent as in female except ventral margin which contains legs and associated apodemes. Legs I and II highly modified as in female. Head plate, type and number of setae located posterior to head plate similar to female. Pair of long setae near coxa III similar to female in structure. Legs with four segments, not clearly delineated. Apodemes of leg III fuse with those of leg II, with keel-like protrusion located betwen legs II and III (Fig. 10a). Leg III with single main claw, 2 accessory spurs, single triangular spine. Last 2 segments of leg III narrow, wide proximal segments stout; those in leg IV more or less equal throughout. Leg IV with single main claw, 1 accessory spur, single triangular spine; main claw longer than main claw of leg III. Series of fine annulations extends from head plate to insertion of coxa IV. Remainder of abdomen free of annulations. Posterior section with longitudinal slit, each side contains pair of anal setae of same size and structure. Sclerotized male reproductive organs within slit; extend when in contact with copulatory female.

Larva: Body egg shaped, with annulations; gnathosoma developed; 3 pairs of legs. Legs I and II well developed, same specialized structures as adult; leg III contains four not clearly delineated segments; well-developed main claw, curved as on adult; 2 straight, subequal accessory spurs. Triangular spine characteristic of species seen as small spine between main claw and accessory spur. Coxal apodemes united, form U between legs. Well-developed setae on body anterior, 2 long anal setae at body posterior. Description made from larva contained within female body (Fig. 9).

Type Data: Holotype ex *Tadarida laticaudata yucatanica*, 4.8 km N Antigua Morelos, Tamaulipas, Mexico.

Venezuelan Records

One female (hexapod larva within body) ex *Sturnira lilium* (SVP 120), Dto. Federal, 4 km N Caracas, 1465 m elev., 23-VII-65; 1 copulatory female ex *Glossophaga longirostris* (SVP 5812), Apure, 46 km NE Puerto Paez, Hato Cariben, Río Cinaruco, 76 m elev., 23-XII-65; 1 copulatory female, 2 males, host (SVP 6260) as above, Apure, 38 km NW Puerto Paez, Río Cinaruco, 19-I-66; 1 female, 1 male ex *Molossus bondae* (SVP 7112), Yaracuy-Carabobo border Río Yaracuy, 10 km NW Urama, 25 m elev., 17-III-66; 1 female, 1 copulatory female, 1 male, host (SVP 7151) as above except 17-III-66; 1 copulatory female, 1 male ex *Molossus ater* (SVP 13407), Sucre, 7 km N, 5 km E Güiria (Ensenada Cauranta), 10-VI-67; 4 females, hosts (SVP 13717, 13723, and 13738) as above, Monagas, 3 km N, 4 km W Caripe, San Agustin, 1160 m elev., 26-VI-67; 3 females, 1 copulatory female, 2 males; 1 hexapod nymph, hosts (SVP 13755 and 13756) and data as above except 1180 m elev., 27-VI-67; 3 females, 3 males, 3 nymphs, hosts (SVP 13770 and 13776) and data same as SVP 13717 except 28-VI-67; 2 females (1 with hexapod larva within body), 2 copulatory females, 2 males, 1 nymph, host (SVP 13773) and data same as SVP 13717 except 1165 m elev., 28-VI-67; 1 female, 1 copulatory female, 1 male, host (SVP 13791) and data same as SVP 13717 except 29-VI-67; 2 females, 1 copulatory female 1 male hosts (SVP 13979 and 13981), and data same as SVP 13717 except 6-VII-67; 1 female, 1 copulatory female, 3 males, 5 nymphs, host (SVP 14009), and data as above except 7-VI-67; 5 females (1 with hexapod larva within body), 4 copulatory females, 3 males, 1 nymph ex *Molossus ater* (SVP 28776, 28777, and 28798), T. F. Amazonas, 4 km NE San Juan, Río Manapiare, 155 m elev., 24-VII-67; 1 female (hexapod larva within body), 1 copulatory female, 2 males ex *Noctilio labialis* (SVP 28744), T. F. Amazonas, 4 km NE San Juan, Río Manapiare, 24-VI-67; 1 female ex *Carollia brevicauda* (SVP 13736), Monagas, 3 km N, 4 km W Caripe, San Agustin, 1160 m elev., 25-VI-67; 1 male, host (SVP 31979) as above, Carabobo, 9 km NE Montalbán, Cumbre Canoabo, 1-XI-67.

Remarks

Parakosa tadarida commonly parasitizes numerous species of bats from the southern United States to Venezuela. It was first recorded from a free-tailed bat in Mexico and has since been recorded from the United States, Nicaragua and now in Venezuela from members of the families Molossidae (Mexico, United States, Nicaragua and Venezuela), Noctilionidae (Venezuela), and Phyllostomidae (Venezuela). It was found to be a major parasite on some species of bats in Venezuela.

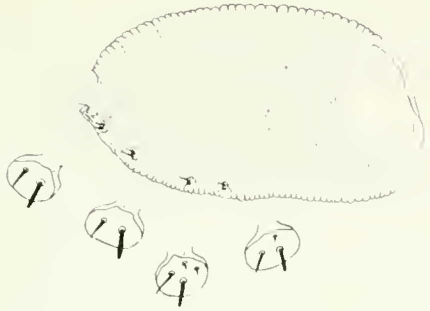
Parakosa maxima McDaniel

Parakosa maxima McDaniel, 1970:804.

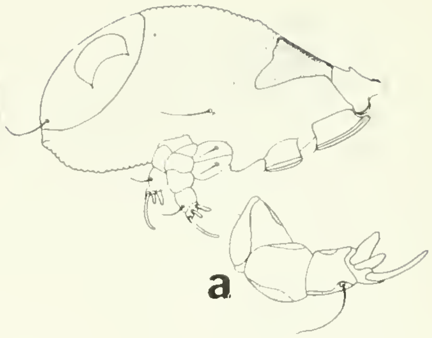
Redescription

Male: Body laterally compressed with numerous (51±) fine annulations; skin transparent except for gnathosoma, anterior propodosomal plate, coxal apodemes and opisthosomal region. Legs I and II highly modified, usual labidocarpid type with plates flaplike, dilated distally, and adapted for fitting around hair of host. Legs III and IV with four segments; those of leg III more compact than leg IV. Leg III shorter than leg IV with main single claw larger than accessory spurs, slightly curved throughout with acute curvature at apex; two accessory spurs, shorter and thicker than main claw, with inner surfaces furrowed, knifelike with sawtoothed apex; inner spur broader and longer than outer spur (Fig. 11); "triangular spine" between main claw and inner accessory spur much longer than as found in other species of this genus and is curved at base; 2 pairs setae associated with claw, spurs, and spine; bases near tarsus pseudoarticulation; 2 pairs setae on tarsus above pseudoarticulation; 1 pair on ventral surface; other on dorsal surface. Keeled region between legs II and III with 1 pair of setae. Leg IV with single main claw much longer than main claw of leg III, curved, more acute at apex; single accessory spur broadest at base with knife-edge furrow extending only to acute curvature of spur; accessory spur apex bent at angle greater than distal end of main claw, terminating in rounded point, this region without furrows; "triangular spine" similar as on leg III with curved base but forked at end (Fig. 11); 2 pairs setae placed below pseudoarticulation of tarsus, associated with claw, spur, and spine; 1 pair dorsal setae on tarsus adjacent to and above pseudoarticulation. Gnathosoma long; palpi broad, cover dorsal region, without recurved teeth. Chelicerae large, occupy whole gnathosomal region, terminate in two digits bearing teeth. Propodosomal plate small, blends with leg I apodemes. Two pairs propodosomal setae associated with propodosomal plate margin; large, length extends beyond body, longer than gnathosomal region. Two pairs lateral setae between legs II and III in proximity of coxa III, their length extends to sclerotized opisthosomal region of body. Anal region with pair of large anal suckers (Fig. 11), 3 pairs anal setae, 2 dorsal pairs longer than leg IV main claw. Anal area with sclerotized plate in dorsal region, not extending to venter (Fig. 11). Pair of minute setae placed in middle of opisthosomal region near sclerotized plate. Other body setae shown in Fig. 11. Length 0.767 mm, width 0.302 mm (measured between legs II and III).

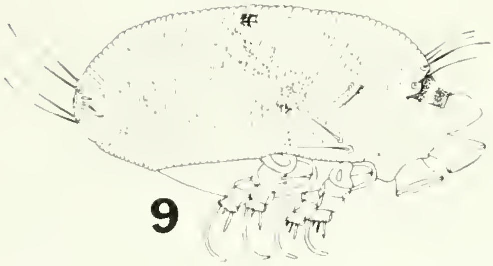
Female: Body laterally compressed with numerous (78±) fine annulations; skin transparent except for gnathosoma, propodosomal plate and coxal apodemes of all legs. Legs I and II modified as on male. Legs III and IV with main tarsal claw and accessory spurs as on male, with same setal association. Keeled region between leg IV apodemes with 1 pair of setae. Gnathosoma similar to male only larger; palpi similar to male, without recurved teeth. Chelicerae similar to male only larger; with 2 digits, one bears a single tooth. Propodosomal plate similar to male only larger with propodosomal setae in rounded indentation of plate (Fig. 12). Two pairs propodosomal setae, longer than total gnathosomal length. Lateral setae similar to male only larger, length extending to coxa IV. Anal region without sclerotization, with 3 pairs of minute setae, 2 pairs large anal setae; annulation absent on extreme apex of body (Fig. 12). Other body setae shown in Fig. 12. Length 1.079 mm, width 0.419 mm (measured between legs II and III). *Copulatory Female.* Body elongated with fully formed female within puparium in some, absent in others; body annulations (59±) narrow on some parts of body, wide in other regions. Chelicerae well developed, 2 digits with structure similar to female and male. Propodosomal plate indicated, associated with 2 pairs of setae similar in structure as adult. Two pairs of lateral setae well developed; dorsal pair large, similar in length and size to lateral setae on adult; ventral pair small, length not exceeding width of 2 annulations on that body region (Fig. 13). Anal region with winglike process to clasp male. Four pairs of spined papillae, first pair two-segmented with 2 apical



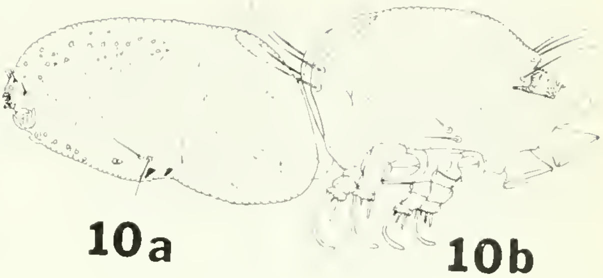
7



8

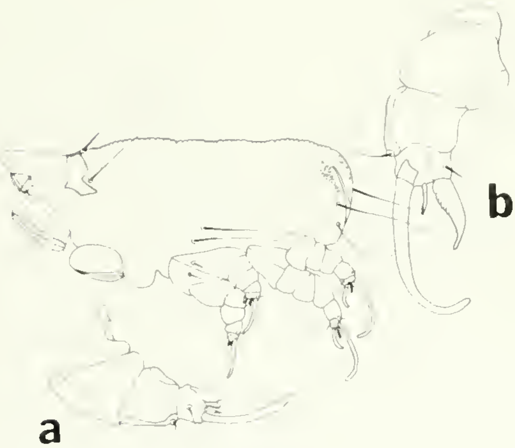


9

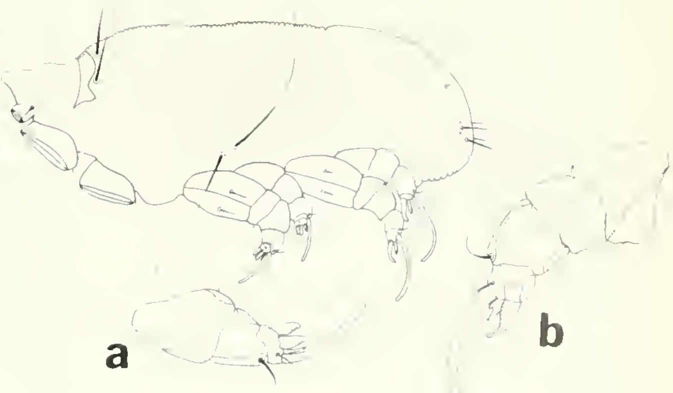


10a

10b



11



12

Figs. 7-12. (7)*Alabidocarpus jonesi* McDaniel, Copulatory female. (8) *Alabidocarpus jonesi* McDaniel, Nymph. a. leg III. (9)*Parakosa tadarida* McDaniel and Lawrence, Female with Nymph shown within body. (10) *Parakosa tadarida* McDaniel and Lawrence, a. Copulatory female, b. male. (11) *Parakosa maxima* McDaniel, Male, a. leg III, b. leg IV. (12) *Parakosa maxima* McDaniel, Female, a. leg III, b. leg IV.

spines; second pair single without spines; third pair two-segmented leglike, with first segment similar to coxa, with 1 spine; fourth pair large, three-segmented with 1 spine. Third and fourth pairs of papillae form separate groups far removed from papillae I and II, placed posterior to 2 pairs of lateral setae (Fig 13). Puparium with fully developed female resembling mature female in body structure, setae placement, structure, tarsal claw, and spur arrangement. Length 0.884 mm, width 0.372 mm (measured at site of lateral setae).

Larva: Body laterally compressed with numerous (35±) annulations; skin transparent except for same area sclerotized in female. Legs I and II modified for clasping hair as on adults. Leg III with same type claw, spurs, and tarsal setae as on female. Gnathosomal length similar to male, palpi broad without recurved teeth. Chelicerae well developed for feeding, approximately as long as gnathosoma, expanded basally as in mature forms, terminates in 2 digits which bear teeth. Propodosomal plate developed similar to structure in female, associated with 2 pairs of propodosomal setae. Two pairs of lateral setae equal in length, extend well beyond coxa of leg III. Hysterosomal dorsum without annulations, contains winglike processes (Fig. 14). Opisthosomal region with annulations (the count of 35± annulations for the hexapod larva includes these annulations). One pair of minute setae just below winglike processes. Two pairs of anal setae, dorsal pair shorter than ventral pair (Fig. 14). Other body setae as shown in Fig. 14. Length 0.535 mm, width 0.209 mm (measured between legs II and III).

Parakosa maxima McDaniel is distinguished from all other members of the genus by its large size, peculiar spurs, triangular spine, large anal suckers of the male and curved single spur on leg IV.

Type Data: Male holotype ex *Molossus pretiosus* (KU 111245) 3 km N, 4 km W Diriamba, Carazo, Nicaragua, 500 m elev., 16-VIII-67, collected by H. H. Genoways (HHG-1374).

Venezuelan Records

Fifteen females, 5 copulatory females, 11 males, 2 nymphs ex *Molossus ater* (SVP 5730, 5732, 5733, 5736, 5737, 5739, 5740, 5741, 5742, 5743, 5745, 5746 5748, and 5752) Apure 46 km NE Puerto Paez, Hato, Cariben, Río Cinaruco, 76 m elev., 17-XII-65; 1 female, host (SVP 13407) as above, Sucre, 7 km N, 5 km E Guiria (Ensenada Cauranta), 1160 m elev., 10-VI-67; 1 copulatory female, 2 males, hosts (SVP 13727 and 13738) as above, Monagas, 3 km N, 4 km W Caripe, San Agustin, 26-VI-67; 1 female, 1 copulatory female, 2 males, host (SVP 13755), and data as above except, 27-VI-67; 1 female, 1 copulatory female, 1 male, host (SVP 13770), and data as above except 28-VI-67; 5 females, 1 nymph, hosts (SVP 13974, 13975, 13976, and 13977), and data as above except 6-VII-67; 3 females, 1 copulatory female, 2 males, hosts (SVP 13995, 14003, and 14008), and data as above except 7-VII-67; 8 females, 6 copulatory females, 5 males, 3 nymphs, hosts (SVP 28771, 28773, 28777, 28796, and 28798) as above, T. F. Amazonas, 4 km NE San Juan, Río Manapiare, 155 m elev., 24-VII-67; 2 copulatory females, 2 males, host (SVP 31516) as above, T. F. Amazonas, 65 km SSW Puerto Ayacucho, Morocoy, 8-X-67; 6 females, 2 nymphs ex *Molossus bondae* (SVP 7105, 7108, and 7116), Yaracuy-Carabobo, Río Yaracuy, 10 km NW Urama, 25 m elev., 17-III-66; 1 female, 1 nymph, host (SVP 7151) as above; 3 females, 1 copulatory female, 1 male, 1 nymph ex *Molossus major* (SVP 7106 and 7119), Yaracuy-Carabobo border, Río Yaracuy, 10 km NW Urama, 25 m elev., 17-III-66; 1 female, 1 male ex *Molossus major* (SVP 9047) Bolivar, 59 km SE El Dorado, Km 74, El Manaco, 150 m elev., 8-VI-66; 1 female, 1 copulatory female, 1 male ex *Molossus major* (SVP 9457 and 9459), data as above except 17-VI-66; 2 females, 1 copulatory female, 1 male ex *Molossus ater* (SVP 9049), data as above except 9-VI-66; 2 females, host (SVP 9861), and data as above except 20-VI-66; 1 female, 1 male, 1 nymph, host (SVP 15580) as above, T. F. Amazonas, Río Cunucunuma, Belén, 150 m elev., 6-I-67; 1 female ex *Artibeus harti* (SVP 1116), Dto. Federal, 5 km NNE Caracas, 2092 m elev., 10-IX-65; 1 copulatory female, 1 male ex *Glossophaga longirostris* (SVP 5665), Apure, 46 km NE Puerto Paez, Hato Cariben, Río Cinaruco, 76 m elev., 14-XII-66; 1 female, 1 nymph ex *Noctilio labialis* (SVP 28744), T. F. Amazonas, 4 km NE San Juan, Rio Manapiare, 155 m elev., 24-VII-67.

Remarks

Parakosa maxima is a large species and, like *P. tadarida*, is found on many species in Central and South America. It is commonly associated with *P. tadarida* on the same host species. Knowledge of its position on the host might help to establish the relationship of this large parasite to its close relative *P. tadarida*. This species occurs on bats of the families Molossidae (Nicaragua and Venezuela), Noctilionidae (Nicaragua and Venezuela) and Phyllostomidae (Venezuela). In numbers of individuals this was the most numerous labidocarpid parasite collected in Venezuela.

Genus *Lawrenceocarpus* Dusbàbek and Cruz

Lawrenceocarpus Dusbàbek and Cruz, 1966:3. —McDaniel 1970:819.

Type Species: *Lawrenceocarpus micropilus* Dusbàbek and Cruz, 1966, ex *Chilonycteris fuliginosa torrei*.

Lawrenceocarpus phyllostomus, new species

Description

Female: Body laterally compressed with numerous (52±) fine annulations; exoskeleton transparent except for gnathosoma, anterior propodosomal plate and coxal apodemes of legs. Legs I and II usual labidocarpid type with plates flaplike, dilated distally, adapted for fitting around hair of host (Fig. 15). Legs III and IV with normal leg segments; leg III shorter and thicker than leg IV, single accessory spur with broadly rounded, serrated apex typical of genus (Figs. 15, 15a); 2 setae associated with tarsus and region bearing claw and accessory spur; 1 pair of setae associated with coxal apodemes. Leg IV much longer than leg III; tarsus with single main long claw, curved, associated with single accessory spur, much longer but narrower than accessory spur of leg III (Fig. 15a). Accessory spur similar in length to same spur on *L. lobus* McDaniel, but shaped differently at apex; shorter than same spur on *L. micropilus* Dusbàbek and Cruz. Single seta placed below pseudoarticulation of tarsus associated with main claw; single seta above pseudoarticulation of main claw. Setae smaller and shorter on leg III than on leg IV (Fig. 15a). Gnathosoma long, chelicerae with well-developed denticles. Propodosomal plate well developed, extends to posterior margin of coxa II (Fig. 15). Two large setae associated with plate similar in shape and size to those on tarsus IV. Other body setae small, not extending beyond body margin; most anterior pair placed near coxa III; 2 pairs of setae located between legs III and IV; 2 pairs located posterior to leg IV; all of similar shape and size. Two pairs anal setae of similar length as propodosomal plate setae. Anus curved, longitudinal slit bounded by anal setae. Length of female 0.623 mm, width 0.219 mm (measured between legs III and IV). *Copulatory Female.* Not available for study.

MALE: Body laterally compressed as in female with numerous (37±) annulations; skin transparent except for anterior gnathosoma, propodosomal plate, coxal apodemes and opisthosomal plate. Legs I and II modified as in female. Legs III and IV of unequal size, leg III much smaller than leg IV. Main claw of leg III modified as spurlike structure similar to accessory spur (Figs. 16, 16a). Main claw of leg IV similar to main claw of female with single accessory spur (Fig. 16a). Gnathosoma similar to female, not exposed. Chelicerae same as female, bears teeth on digits. Propodosomal plate similar to female, apex more rounded. Two large propodosomal setae similar to female. Pair of lateral setae located near and anterior to coxa III, shorter than propodosomal setae; another pair between leg III coxal apodemes (Fig. 16). Similar pair of setae placed between modified legs I and II. Opisthosomal region with sclerotized plate; 1 pair of anal suckers and 4 anal setae (Fig. 16). Size and shape of anal setae shown in Fig. 16. Length 0.520 mm, width 0.232 mm (measured between legs III and IV).

LARVA: Body laterally compressed with numerous (27±) annulations; skin transparent except for same sclerotized area as female. Legs I and II modified for clasping hair as on adult. Leg III with same type claw, spur, and setae as female. Gnathosomal length similar to male, chelicerae well developed for feeding, approximately as long as gnathosoma, terminating in two digits which bear teeth. Propodosomal plate well developed, similar shape as adult male, associated with pair of propodosomal setae (Fig. 17). Single pair of lateral setae, shorter than propodosomal setae, located near coxa III. Similar pair of setae located on leg III coxal apodemes. Other body setae smaller in size than lateral and apodeme setae; 4 pairs placed as shown in Fig. 17. Hysterosomal region without annulations, contains winglike processes (Fig. 17). Opisthosomal region with indications of small annulations associated with 2 large anal setae. Length 0.381 mm, width 0.158 mm (measured between legs II and III).

TYPE DATA: Male holotype, female allotype, and 4 female paratypes, ex *Phyllostomus elongatus* (SVP 18887), T. F. Amazonas, Tamatama, Río Orinoco, Venezuela, 5-VIII-67, M.D. Tuttle and F.L. Harder collectors. One female paratype ex *Micronycteris hirsuta* (SVP 18109), Río Mavaca, 108 km SSE Esmeralda, 140 m. elev., 14-IV-67. Holotype, allotype, and 1 paratype in U.S. National Museum.

Pseudoalabidocarpus, new genus

Body laterally compressed with numerous fine annulations; skin unsclerotized except for gnathosoma, propodosomal plates, and coxal apodemes of legs. Legs I and II modified as in all Labidocarpidae with plates flaplike, dilated distally, adapted for fitting around hair of bat host. Leg III with single main claw and 2 accessory spurs. Leg IV with single main claw and 1 accessory spur. Main claw of both legs longer than tarsus, rounded at top. Propodosomal setae long, extend beyond body. Opisthosomal region with 2 pairs of anal setae on female, longer than propodosomal setae (Fig. 16). Genus characterized by leg III having 2 accessory spurs, leg IV with single accessory spur and the main claw longer than tarsus and rounded at tip. Propodosomal setae longer than propodosomal shield; 2 pairs of anal setae on female.

Type Species: *Pseudoalabidocarpus secus*, new species, ex *Phyllistomas elongatus*.

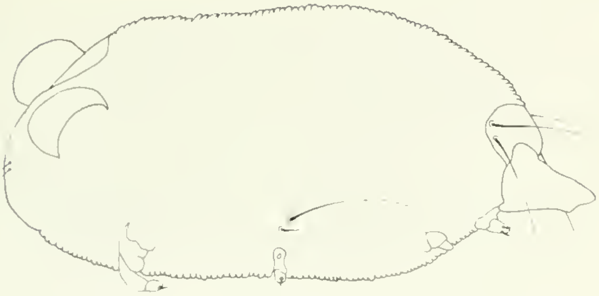
Pseudoalabidocarpus secus, new species

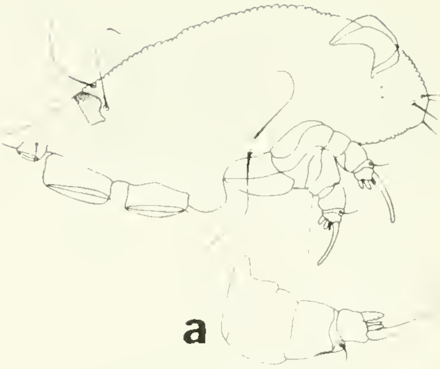
Description

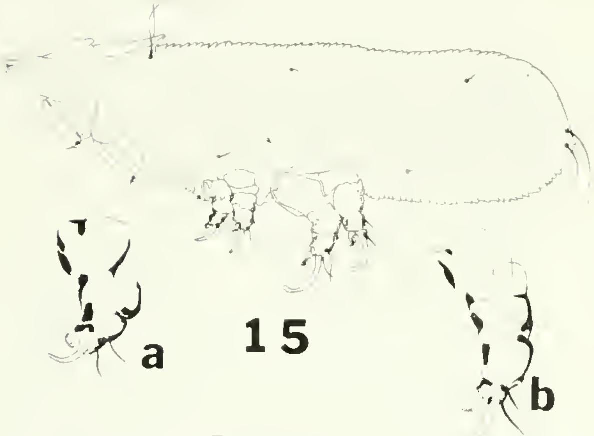
Female: Body laterally compressed with numerous (51±) fine annulations; body unsclerotized except for gnathosoma, anterior propodosomal plates, and coxal apodemes. Legs I and II modified, of usual labidocarpid type with plates flaplike, dilated distally, adapted for fitting around hair of host. Legs III and IV similar in shape; leg IV longer and narrower than leg III. Leg III with main single claw longer than tarsus, not curved, rounded at tip shorter than leg IV main claw, longer than accessory spurs; 2 accessory spurs, subequal in size, both have furrowed inner surface, flat and somewhat spoon shaped (Fig. 18). Keel-like chitinous bar anterior to leg III, forms V-shaped structure for clasping host's hair. Prominent setae located on posterior side at distal portion of tibiae. Large seta, shorter than setae on tibia, located at base of main claw. Leg IV longer than leg III with single main claw curved, much longer than leg III main claw; 1 accessory spur, larger and thicker than either leg III accessory spurs with furrows, shape of spur broad at apex, tapers to rounded base; prominent large seta on posterior side at distal portion of tibia similar to same seta on leg III; small seta located at base of main claw. Chelicerae small, occupy whole gnathosomal region, extend to leg I apodemes, expanded basally, terminate apically in 2 digits bearing teeth (Fig. 18). Propodosomal plate elongate with pair of large setae; another pair of large setae similar in size and shape located between legs I and II. Two pairs of lateral setae placed just above apodemes of legs III, subequal in size, ventral pair longer than dorsal pair. Another large pair of lateral setae placed between legs III and IV; similar in size and shape to ventral lateral setae located near apodemes of leg III. Other setae arranged as shown in Fig. 18. Anus longitudinally slit with dorsal and ventral protruding lobes, 2 pairs of large anal setae, length exceeds opisthosomal region. Length of female holotype 0.400 mm, width 0.139 mm (measured between legs II and III). *Copulatory Female.* Body elongated, attached to male without evidence of female within puparium; similar to holotype female, annulations 44+. Gnathosomal region well developed, pointed, shows indication of chelicarae (Fig. 20). Legs not developed; propodosomal setae well developed, similar to female. Single seta located near gnathosoma, smaller than propodosomal setae. Pair of ventral lateral setae located on body midregion. No evidence of papillae. Anal region with winglike process for attachment to male. Length 0.232 mm, width 0.139 mm (measured at site of single lateral seta).

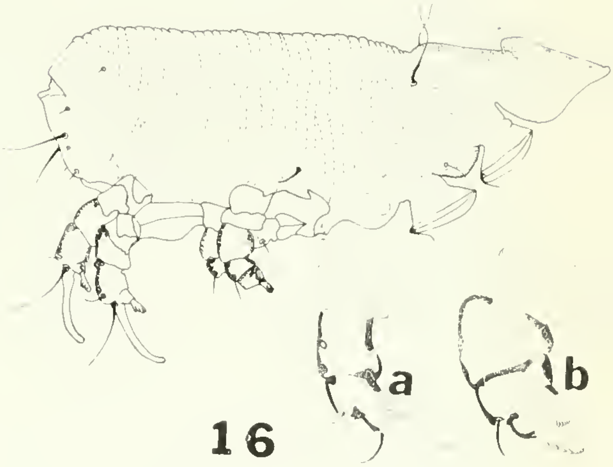
Male: Body laterally compressed with numerous (27±) fine annulations; body unsclerotized except for gnathosoma, propodosomal plates, coxal apodemes and opisthosomal plate. Legs I and II modified as on female. Legs III and IV with same number of accessory spurs (Fig. 19). Propodosomal setae well developed, similar in structure as female (Fig. 19). Another pair of setae located between propodosomal setae and apodemes of legs II; similar in size, shape, and structure to propodosomal setae. Another pair of large setae between enlarged clasping plates separating legs II and III. Two pairs of lateral setae, smaller than propodosomal setae, located just above legs III and IV apodemes. Anal region with pair of anal suckers. Two pairs of anal setae; dorsal pair longer and larger than ventral pair; both pairs longer than opisthosomal region of body; similar in structure to propodosomal setae. Opisthosomal region bears sclerotized plate (Fig. 19). Other body setae shown in Fig. 19. Length 0.297 mm, width 0.121 mm (measured between legs II and III).

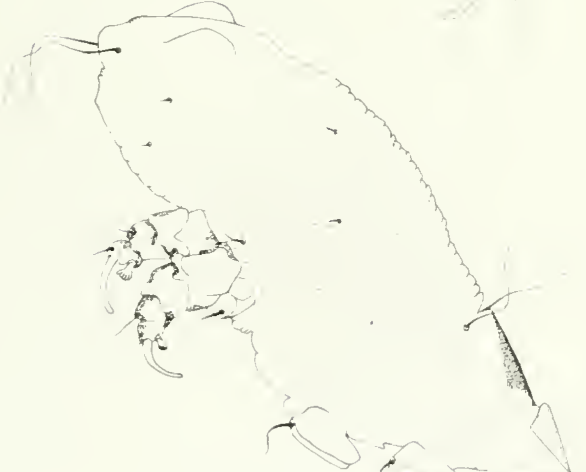
Larva: Body laterally compressed as in adult with numerous (27±) fine annulations. Sclerotized area same as male and female. Legs I and II modified for clasping hair as in adults. Leg III with same type claw and tarsal setae as leg IV of female. Gnathosomal length similar to male; chelicerae well developed for feeding, approximately as long as gnathosoma, digits terminate with well-developed teeth. Proposomal plate developed similar to female, associated with pair of propodosomal setae similar to female, located on plate as on female (Fig. 21). Pair of setae in same position as on female, similar in structure to propodosomal plate setae. Two large setae located on sclerotized leg III apodeme region. Hysterosomal dorsum without annulations, contains winglike processes for clasping male. Opisthosomal region with 3 annulations (Fig. 21). Pair of anal setae located on annulated region below annulated opisthosomal region. Other setae shown in Fig. 21. Length 0.251 mm, width 0.93 mm (measured between legs II and III).

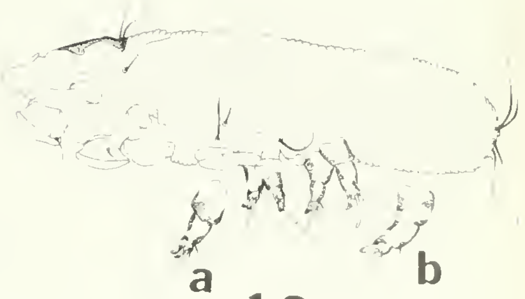












Figs. 13-18. (13) *Parakosa maxima* McDaniel, Copulatory female. (14) *Parakosa maxima* McDaniel, Nymph, a. leg III. (15) *Lawrenceocarpus phyllostomus*, new species, female, Allotype, a. leg III, b. leg IV. (16) *Lawrenceocarpus phyllostomus*, new species, Male, Holotype, a. leg III, b. leg IV. (17) *Lawrenceocarpus phyllostomus*, new species, Nymph. (18) *Pseudolabidocarpus secus*, new species. Female, Allotype, a. leg III, b. leg IV.

Type Data: Female holotype, male allotype, 11 female and 5 male paratypes ex *Phyllostomus elongatus* (SVP 17517), T. F. Amazonas, 108 km SE Esmeralda, Río Mavaca, Venezuela, 5-IV-67, M. D. Tuttle and F. L. Harder, collectors. Also 4 female paratypes *Phyllostomus discolor* (SVP 18116), data as above except 14-IV-67. Other material studied includes 2 copulatory females and 2 hexapod larvae.

Remarks

Pseudoalabidocarpus secus is distinguished by leg III having a single main claw and 2 accessory spurs and leg IV having a single main claw and accessory spur. The genus *Pseudoalabidocarpus* is most closely related to members of the genus *Alabidocarpus*, but differs in having propodosomal setae well developed and extending beyond body region. *Pseudoalabidocarpus* differs from the genus *Parakosa* by absence of the triangular spine on legs III and IV.

Genus *Labidocarpus* Trouessart

Labidocarpus Trouessart, 1895:39. — Pinichpongse 1963*a*:81.

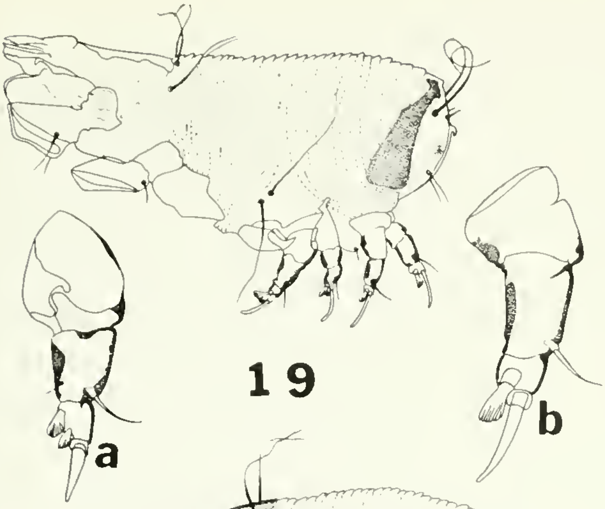
Type Species: *Labidocarpus rollinatia* Trouessart, 1895, ex *Phinolophus ferrum-equinum*.

Labidocarpus dossuarius, new species

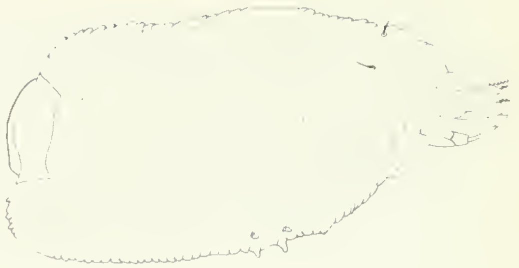
Description

Female: Body laterally compressed, elongated, with numerous (52±) fine annulations; transparent except for anterior head plates, propodosomal plate, coxal apodemes of legs and enlarged clasping region between legs II and III (Fig. 22). Legs I and II highly modified as in all Labidocarpidae with plates flaplike, dilated distally and adapted for fitting around hair of bat host. Flaplike clasping structures well developed between second and third pair of legs to aid in clasping and clinging to host's fine hairs. Legs III and IV similar in shape. Leg III with single main claw and accessory spur (Fig. 22a); main claw much shorter than leg IV main claw, curved, somewhat bluntly rounded at apex; accessory spur curved, furrowed inner surface; single seta located at tibia apex, short and stout in structure. Leg IV with long main claw of usual labidocarpid type with distal portion hairlike and projecting at an angle (Fig. 22a); single accessory spur, shorter and thicker than leg III accessory spur, apex furrowed, inner surface flat and somewhat spoon shaped. Keel-like chitinous structure associated with apodeme of leg III well developed. Apex flaps of legs I and II with single seta; setae on leg I larger than on leg II. Gnathosoma elongated, produced into pointed apex. Chelicerae small, expanded basally, terminate apically in two digits bearing teeth. Propodosomal plate elongate, narrowed anteriorly. Propodosomal setae not located on sclerotized plate. Two pairs lateral setae similar to propodosomal setae, extend beyond body region as do propodosomal setae. Lateral setae located near apodemes of legs III and IV, subequal in size. Other body setae shown in Fig. 22. Anus longitudinal slit. Two pairs anal setae similar in shape to lateral and propodosomal setae. Length of female holotype 0.269 mm, width 0.84 mm (measured between legs III and IV). *Copulatory Female.* Body elongate, some forms attached to male with fully formed female within puparium, absent in others; annulations total 35±, narrow in some regions, wide in others (Fig. 24). Leg III with same type claw and accessory spur as female. Gnathosomal length short; chelicerae well developed, digits terminate with well-developed teeth. Propodosomal plate well developed, similar to female, associated with two large propodosomal setae (Fig. 24). Large seta located near leg II apodeme, larger and longer than propodosomal setae. Lateral setae present, similar to lateral setae on adults. Hysterosomal dorsum without annulations, contains winglike processes for clasping male. Opisthosomal region with 2± annulations. Single pair of anal setae located on unannulated region below winglike claspers. Length 0.213 mm, width 0.74 mm (measured between legs II and III).

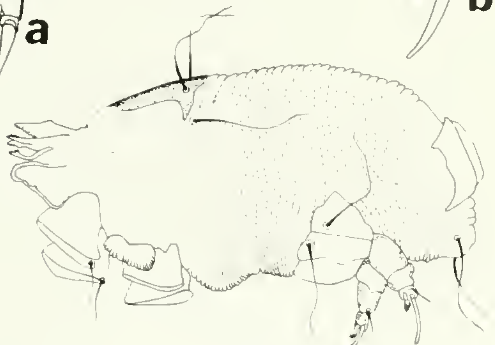
Male: Body laterally compressed, much shorter and smaller than female, not elongated, with numerous (33+) fine annulations; unsclerotized except for gnathosoma, propodosomal plate, coxal apodemes and opisthosomal plate (Fig. 23). Legs I and II modified as on female. Legs III and IV with same number accessory spurs as female (Fig. 23a). Legs I and II with single seta at posterior margin of dilated flaplike plates. Leg III larger than leg IV; main claw shorter than leg IV main claw, tapers more at apex than similar claw of female; with single accessory spur similar to accessory spur on female but smaller. Single seta at posterior margin of tibia. Leg IV main claw much longer than main claw on leg III; similar to same claw on female. Single seta at posterior margin of tibia. Small microseta on inner anterior tibia apex. Flaplike clasping structures located between second and third leg pairs well developed as on female. Gnathosoma short, blunted at apex. Chelicerae not clearly delineated. Propo-



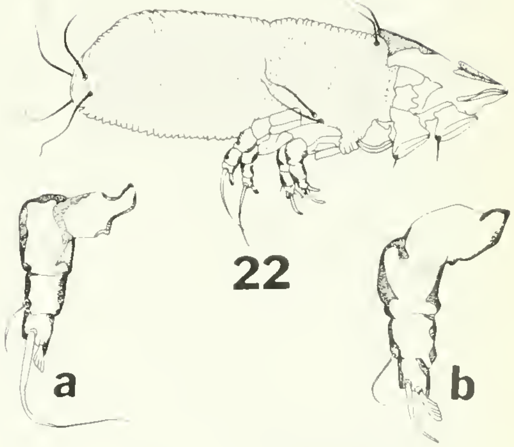
19



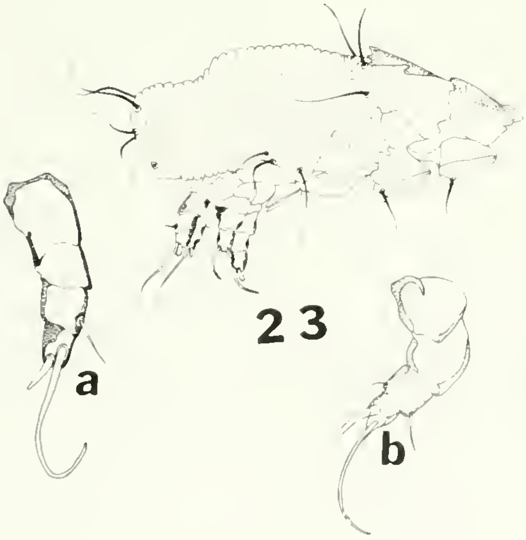
20



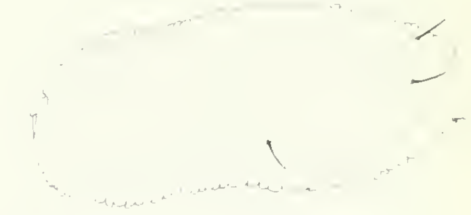
21



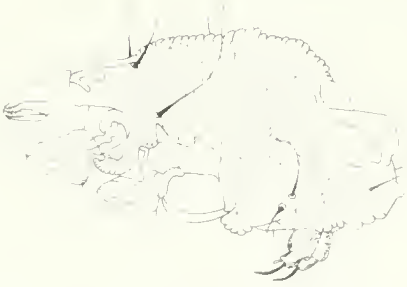
22



23



24



25

Figs. 19-25. *Pseudolabidocarpus secus*, new species, Male, Holotype, a. leg III, b. leg IV. (20) *Pseudolabidocarpus secus*, new species, copulatory female. (21) *Pseudolabidocarpus secus*, new species, Nymph. (22) *Labidocarpus dossuarius*, new species, female, Holotype, a. leg III, b. leg IV. (23) *Labidocarpus dossuarius*, new species, Male, Allotype, a. leg III, b. leg IV. (24) *Labidocarpus dossuarius*, new species. Copulatory female. (25) *Labidocarpus dossuarius*, new species, Nymph.

dosomal plate similar to female, elongate, setae not located on main plate area (Fig. 23). Claw of leg III short, straight or sharply curved (one leg may have main claw straight and short, other leg may have claw curved and almost as long as main claw of leg IV). Single large seta associated with posterior distal tibia region. Leg III with small microseta on anterior tibia edge (Fig. 23a). Accessory spurs of leg III unequal in size; spur next to base of main claw smaller than spur located near attachment of tarsus to tibia. Accessory spurs of leg IV similar to same spur on female. Propodosomal setae at posterior margin of propodosomal plate; similar in number, size, and structure to female. Lateral setae similar to female except subequal length; located near apodemes of legs III. Anal region with pair of anal suckers. Two pairs of anal setae; dorsal pair longer than opisthosomal region of body; similar structure as propodosomal and lateral setae. Ventral anals small, not longer than opisthosomal region of body. Pair of small setae placed below anal suckers (absent on female). Opisthosomal region bears sclerotized plate; anal suckers not associated with plate. Other body setae shown in Fig. 23. Length 0.167 mm, width 0.65 mm (measured between leg III and leg IV).

Larva: Body laterally compressed as in adult with numerous (26±) fine annulations; sclerotized region similar to male and female. Leg III with normal development of claw and accessory setae, similar to female. Leg IV missing; legs I and II modified for clasping hair as on adults (Fig. 25). Gnathosomal length similar to male; chelicerae exposed, digits terminate with well-developed teeth. Propodosomal plate and setae well developed, similar to female. Part of hysterosomal region without annulations, contains winglike process for clasping male. Other setae shown in Fig. 25. Length 0.120 mm, width 0.55 mm (measured between legs II and III).

Type Data: Female holotype, male allotype, 8 female and 1 male paratypes ex *Molossus major* (SVP 9459), Bolívar, 59 km SE El Dorado, Km 74, El Manaco, 150 m elev., 17-VI-66, M. D. Tuttle and A. L. Tuttle collectors. Other material studied includes 1 copulatory female and 1 hexapod larva.

Remarks

Labidocarpus dossuarius is distinguished by the structure of the accessory spur, the large setae of the male associated with the clasping structure between the apodemes of legs II and III, development of this clasping structure, length of the main claw of leg III, shape of the propodosomal plate and the small size of the male.

Genus *Paralabidocarpus* Pinichpongse

Paralabidocarpus Pinichpongse 1963*d*:620.

Type Species: *Paralabidocarpus artibei* Pinichpongse, 1963, ex *Artibeus lituratus palmarum*.

Paralabidocarpus tonatiae Fain

Paralabidocarpus tonatiae Fain, 1970:298.

Description (Fain, 1970)

"Distinguished from *P. artibei* Pinichpongse by the larger size and by the greater tapering of the anterior region of the body, the unequal setae "h" and "sh." Holotype male 285 μ long 105 μ wide; allotype female 420 μ x 120 μ (lateral view)."

Type Data: Holotype ex *Tonatia venezuelae*, Royal des Sciences Naturelles de Belgique.

Remarks

Specimens of this species have not been seen. Fain's original description is given above, translated from French by the author. Illustrations were not made of this species by Fain; however, the author indicated that a forthcoming publication will include detailed description data and illustrations of this species.

Key to the Venezuelan Genera of Labidocarpidae

1. Legs III and IV with caruncle in addition to claws and accessory spurs *Paralabidocarpus*[4]
   Legs III and IV without caruncle in addition to claws and accessory spurs 2

2. Legs III and IV similarly armed with single main and accessory spur; main claw of leg IV whiplike .... *Labidocarpus*
   Legs III and IV not similarly armed or, if similarly armed, main claw of leg IV not whiplike 3

---

[4] Recorded by Fain (1970) for *Paralabidocarpus tonatiae* Fain ex *Tonatia venezuelae*, Venezuela

3. Propodosomal setae minute, barely exceeding length of setae base .... *Alabidocarpus*
   Propodosomal setae well developed, extend beyond body region of host 4

4. One pair of lateral setae; accessory spur of leg III modified into short, flattened, serrated structure .... *Lawrenceocarpus*
   Two pairs of lateral setae, accessory spur of leg III not modified into short, flattened, serrated structure 5

5. Legs III and IV with "triangular spine" in addition to main claw and accessory spurs .... *Parakosa*
   Legs III and IV without "triangular spine"; leg III with two accessory spurs and leg IV with a single accessory spur .... *Pseudoalabidocarpus*, new genus

HOST PARASITE LIST OF VENEZUELAN LABIDOCARPID BAT-MITES

- Order - Chiroptera
  - Superfamily - Emballonuroidea
    - Family - Noctilionidae
      - Host species - *Noctilio labialis*
        - *Parakosa tadarida*
        - *Parakosa maxima*
  - Superfamily - Phyllostomoidea
    - Family - Mormoopidae
      - Host species - *Pteronotus parnellii*
        - *Alabidocarpus furmani*
    - Family - Phyllostomidae
    - Subfamily - Phyllostominae
      - Host species - *Micronycteris hirsuta*
        - *Lawrenceocarpus phyllostomus*
      - Host species - *Tonatia venezuelae*
        - *Paralabidocarpus tonatiae*
      - Host species - *Phyllostomus discolor*
        - *Pseudoalabidocarpus secus*
      - Host species - *P. elongatus*
        - *Lawrenceocarpus phyllostomus*
        - *Pseudoalabiocarpus secus*
    - Subfamily - Glossophaginae
      - Host species - *Glossophaga longirostris*
        - *Alabidocarpus furmani*
        - *Parakosa tadarida*
        - *Parakosa maxima*
      - Host species - *Anoura caudifera*
        - *Alabidocarpus furmani*
    - Subfamily - Carolliinae
      - Host species - *Carollia brevicauda*
        - *Alabidocarpus furmani*
        - *Parakosa tadarida*
      - Host species - *C. perspicillata*
        - *Alabidocarpus furmani*
    - Subfamily - Sturnirinae
      - Host species - *Sturnira lilium*
        - *Parakosa tadarida*
    - Subfamily - Stenoderminae
      - Host species - *Uroderma magnirostrum*
        - *Alabidocarpus nicaraguae*
      - Host species - *Vampyrops helleri*
        - *Alabidocarpus furmani*
        - *Alabidocarpus jonesi*
      - Host species - *Artibeus harti*
        - *Parakosa maxima*
  - Superfamily - Vespertilionoidea
    - Family - Molossidae
      - Host species - *Molossus ater*
        - *Parakosa maxima*
        - *Parakosa tadarida*
      - Host species - *M. bondae*
        - *Parakosa maxima*
        - *Parakosa tadarida*
      - Host species - *M. major*
        - *Labidocarpus dossuarius*
        - *Parakosa maxima*

LITERATURE CITED

DUSBÀBEK, F., AND J. DE LACRUZ. 1966. Nuevos generos y especies de Acaros (Acarina: Listrophoridae) parasitos de Murcelagos Cubanos. Poeyana 31:1-20.

EWING, H. E. 1929. Manual of external parasites. C. Thomas Company, Baltimore, 250 p.

FAIN, A. 1970. Diagnoses de nouveaux Lobalgides et Listrophorides (Acarina: Sarcoptiformes). Revue de zoologie et de botanique africaines 81(3-4):271-300.

MCDANIEL, B. 1970. The labidocarpid batmites of Nicaragua (Listrophoroidea: Labidocarpidae). Acarologia 12(4):803-823.

MCDANIEL, B. AND C. C. COFFMAN. 1970. The labidocarpid batmites of the United States (Acarina: Listrophoridae). Proceedings of the Helminthological Society of Washington 37(2):223-229.

MCDANIEL, B. AND R. F. LAWRENCE. 1962. A new genus and species of parasitic mite from Mexico (Acarina: Listrophoridae). Journal of Parasitology 48(3):463-466.

PINICHPONGSE, S. 1963*a*. A review of the Chirodiscinae with descriptions of new taxa (Acarina: Listrophoridae) (1st series). Acarologia 5(1):81-91.

———. 1963*b*. A review of the Chirodiscinae with descriptions of new taxa (Acarina: Listrophoridae) (Part Two). Acarologia 5(2):266-278.

———. 1963*c*. A review of the Chirodiscinae with descriptions of new taxa (Acarina: Listrophoridae) (Part Three). Acarologia 5(3):397-404.

———. 1963*d*. A review of the Chirodiscinae with descriptions of new taxa (Acarina: Listrophoridae) (Part Four). Acarologia 5(4):620-627.

S-NH P[illegible]

Brigham Young University
Science Bulletin

MUS. COMP. ZOOL.
LIBRARY

JAN 5 1973

HARVARD
UNIVERSITY

LAELAPID MITES (LAELAPIDAE: LAELAPINAE) OF VENEZUELA

by

Deane P. Furman

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 3
SEPTEMBER 1972

BRIGHAM YOUNG UNIVERSITY SCIENCE BULLETIN
BIOLOGICAL SERIES

Editor: Stanley L. Welsh, Department of Botany,
Brigham Young University, Provo, Utah

Members of the Editorial Board:

Vernon J. Tipton, Zoology
Ferron L. Andersen, Zoology
Joseph R. Murdock, Botany
Wilmer W. Tanner, Zoology

Ex officio Members:
A. Lester Allen, Dean, College of Biological and Agricultural Sciences
Ernest L. Olson, Chairman, University Publications

The Brigham Young University Science Bulletin, Biological Series, publishes acceptable papers, particularly large manuscripts, on all phases of biology.

Separate numbers and back volumes can be purchased from Publication Sales, Brigham Young University, Provo, Utah. All remittances should be made payable to Brigham Young University.

Orders and materials for library exchange should be directed to the Division of Gifts and Exchange, Brigham Young University Library, Provo, Utah 84601.

Brigham Young University
Science Bulletin

LAELAPID MITES (LAELAPIDAE: LAELAPINAE) OF VENEZUELA

by

Deane P. Furman

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 3
SEPTEMBER 1972

TABLE OF CONTENTS

MITES OF THE FAMILY LAELAPIDAE IN VENEZUELA (ACARINA: LAELAPIDAE)

ABSTRACT 1

INTRODUCTION 1

TAXONOMY 2

Key to Venezuelan Genera of Laelapidae (Females) 2
Genus *Gigantolaelaps* Fonseca 2
Key to Species of *Gigantolaelaps* of the World (Females) 3
Gigantolaelaps aitkeni Lee and Strandtmann 5
Gigantolaelaps amazonae, new species 5
Gigantolaelaps canestrinii Fonseca 8
Gigantolaelaps gilmorei Fonseca 9
Gigantolaelaps goyanensis Fonseca 9
Gigantolaelaps guimaraesi Lizaso 11
Gigantolaelaps inca Fonseca 11
Gigantolaelaps intermedia Furman 11
Gigantolaelaps mattogrossensis (Fonseca) 12
Gigantolaelaps oudemansi Fonseca 12
Gigantolaelaps peruviana (Ewing) 13
Gigantolaelaps tiptoni Furman 14
Gigantolaelaps versteegi (Oudemans) 14
Gigantolaelaps wolffsohni (Oudemans) 16
Genus *Laelaps* Koch 17
Key to South American Species of *Laelaps* (Females) 18
Laelaps acuminata Furman 20
Laelaps (*Echinolaelaps*) *boultoni* Furman and Tipton 21
Laelaps castroi Fonseca 21
Laelaps (*Echinolaelaps*) *conula* Furman 21
Laelaps crinigera Furman 21
Laelaps dearmasi Furman and Tipton 22
Laelaps (*Echinolaelaps*) *echidninus* Berlese 22
Laelaps flexa Furman 22
Laelaps manguinhosi manguinhosi Fonseca 23
Laelaps manguinhosi calvescens, new subspecies 24
Laelaps mazzai Fonseca 24
Laelaps nuttalli Hirst 27
Laelaps ovata Furman 27
Laelaps paulistanensis Fonseca 27
Laelaps pilifer Tipton 28
Laelaps spicata Furman 30
Laelaps surcomata Furman 30
Genus *Tur* Baker and Wharton 30
Key to Species of *Tur* (Females) 31
Tur amazonicus Fonseca 32
Tur apicalis Furman and Tipton 34
Tur aragaoi (Fonseca) 34
Tur aymara Fonseca 36
Tur clavator, new species 37
Tur expansus, new species 37
Tur subapicalis, new species 40
Genus *Mysolaelaps* Fonseca 42
Key to Neotropical Species of *Mysolaelaps* (Females) 43
Mysolaelaps heteronychus Fonseca 43
Mysolaelaps microspinosus Fonseca 44
Mysolaelaps parvispinosus Fonseca 44

Genus *Hymenolaelaps*, new genus 44
Hymenolaelaps princeps, new species 44
Genus *Steptolaelaps* Furman 47
Steptolaelaps heteromys (Fox) 47
Genus *Neoparalaelaps* Fonseca 47
Neoparalaelaps bispinosus (Fonseca) 47
Genus *Androlaelaps* Berlese 49
Key to Species of Venezuelan *Androlaelaps* (Females) 49
Androlaelaps casalis (Berlese) 50
Androlaelaps fahrenholzi (Berlese) 50
Androlaelaps foxi Fonseca 51
Androlaelaps hirsuta, new species 51
Androlaelaps pachyptilae (Zumpt and Till) 54
Androlaelaps projecta, new species 54
Androlaelaps rotundus (Fonseca) 56
Androlaelaps tuberans, new species 56
LITERATURE CITED 57

MITES OF THE FAMILY LAELAPIDAE IN VENEZUELA (ACARINA: LAELAPIDAE)[1]

by

Deane P. Furman[2]

ABSTRACT

This publication presents the results of an extensive survey of symbiotic laelapid mites of vertebrates from Venezuela. Over 40,000 vertebrates were examined from a wide variety of life zones and localities. The laelapid fauna represented includes 1 new genus, *Hymenolaelaps*, and 7 genera previously described: *Laelaps, Mysolaelaps, Tur, Steptolaelaps, Neoparalaelaps*, *Gigantolaelaps*, and *Androlaelaps*. The genera are represented by 51 species and subspecies, of which 8 are described as new. Previously unknown males and immatures of several species are described. *Gigantolaelaps versteegi* (Oudemans) is redescribed from type material; *G. wolffsohni* (Oudemans) is redescribed from Oudemans' original material; *G. peruviana* (Ewing) is redescribed from cotypes. Keys to identification of genera and species are given. Collection data are given for each species together with discussions of morphological characteristics and variability where pertinent. Illustrations of 30 species are provided.

INTRODUCTION

The present study is based on collections of ectoparasites made from over 40,000 vertebrates, mostly mammals, collected in Venezuela from as wide a variety of life zones and localities as possible during the period from July, 1965 through March, 1968. Field crews headed by Messrs Norman Peterson, M. D. Tuttle and A. L. Tuttle collected the hosts and ectoparasites. Dr. Charles O. Handley, Jr., Smithsonian Institution, identified the host animals.

Prior to this report the only published survey of parasitic laelapid mites from Venezuela was that of Furman and Tipton (1961), based on collections from several hundred hosts. Interest in the present study was focused on laelapid mites, since these may fill key roles in epidemiological patterns of arthropod borne zoonoses. Primary objectives were to clarify the systematics of Neotropical parasitic mites, and to provide data on mite-host-habitat associations and geographic distribution in Venezuela.

I acknowledge with gratitude the assistance of the many people associated with this study. Special thanks are proffered to Dr. Vernon J. Tipton of Brigham Young University and Dr. Charles O. Handley, Jr., of the Smithsonian Institution for logistic support. Dr. P. E. Vanzolini and Mr. Lindolpho Guimarães of the Museu de Zoologia da São Paulo made possible my study of critical specimens of the Fonseca collection. For the loan of specimens I am indebted to Drs. L. van der Hammen, E. W. Baker and R. W. Strandtmann. Dr. Bernard Nelson was of great help in collating specimen and host data. Susan McDonald and Barbara Daly did the majority of the art work.

The system of setal nomenclature used herein for the dorsal plate of laelapid mites is that of Lindquist and Evans (1965). For each of the new species described, the holotype, allotype (where known) and 1 or more paratypes are to be deposited in the U.S. National Museum, Washington, D.C. Paratypes are to be deposited in the Field Museum of Natural History, Chicago, Bernice P. Bishop Museum, Honolulu, Universidad Central de Venezuela, Caracas, and in the collection of the author.

---

[1] Supported in part by the Smithsonian Venezuelan Project through contract (DA-49-193-MD-2788) of the Medical Research and Development Command, Office of the Surgeon General, U.S. Army

[2] Department of Entomology and Parasitology, University of California, Berkeley, California 94720

The concept of the family Laelapidae Berlese, 1892, followed here is essentially that given for Laelapinae by Evans and Till (1966) with the following exceptions: the deutosternum bears 5 to 12 transverse rows of denticles; hypertrichy of the dorsal plate may involve the entire plate.

TAXONOMY

Key to Venezuelan Genera of LAELAPIDAE[3]
Females

1. Genitoventral plate with 1 pair of setae. 2
   Genitoventral plate with more than 1 pair of setae. 4

2. Peritremalia not produced posterior of stigmata. Posterior seta of coxa II longer than setae of other coxae, or if not, the coxa bears a strong bifid spur in addition to usual setae. 3
   Peritremalia produced posterior of stigmata; posterior seta of coxa II not longer than all setae of other coxae, and coxae II without a bifid spur. .... *Androlaelaps* Berlese

3. Large, robust mites with prominent spiniform enlargement of some dorsal setae on femur and genu of leg I and with posterior seta of coxa II longer than setae of other coxae. Coxae without ventral spurs. .... *Gigantolaelaps* Fonseca
   Small, delicate mites without marked enlargement of dorsal setae of femur and genu of leg I. Posterior seta of coxa II not abnormally elongated. All coxae bearing 1 ventral spur each, those of coxae I and II bifid. .... *Neoparalaelaps* Fonseca

4. Genitoventral plate with 3 pairs of setae; tarsal claws of legs 2-4 subequal 5
   Genitoventral plate with 4 pairs of setae, or if 1 or more marginal pairs on unarmed cuticula tarsal claws of legs 2 to 4 grossly unequal. 6

5. Robust, strongly sclerotized mites. Movable digit of chelicera strongly toothed, and with 1 to several very long setiform arthrodial processes. Tectum a membranous lobe. .... *Steptolaelaps* Furman
   Delicate, weakly sclerotized mites. Movable digit of chelicera minutely toothed; arthrodial processes very short. Tectum elongated and strongly fimbriated. .... *Hymenolaelaps*, new genus

6. Central setae of dorsal plate minute. Coxae without spiniform setae. *Mysolaelaps* Fonseca
   Central setae of dorsal plate usually well developed, but if not, some coxae with spiniform setae. 7

7. Genu IV with 10 setae. Chelicerae not enveloped in membrane. Arthrodial processes at base of movable chela short. Posterior extension of peritremalia not abnormally broad .... *Laelaps* Koch
   Genu IV with 9 setae. Chelicerae partially or completely enveloped in membrane. Arthrodial processes at base of movable chela usually very long. Peritremalia with broad extension posterior to stigmata .... *Tur* Baker and Wharton

Genus *Gigantolaelaps* Fonseca

Gigantolaelaps Fonseca, 1939*a*:12.

Type Species: *Gigantolaelaps vitzthumi* Fonseca, 1939.

The genus *Gigantolaelaps* consists of very large laelapid mites with idiosoma usually over 1400 μ long. Sternal plate with anteromedial projection. Genitoventral plate with single pair of setae. Posterior seta of coxa II longer than homologous setae of other coxae. Leg chaetotaxy of females differing from that described by Evans and Till (1965) for free-living dermanyssoid mites in having 10 setae on genu IV and either 10 or 11 setae on tibia IV. No apparent extension of peritremalia posterior to stigmata. Habitat primarily in nests and on bodies of cricetid rodents of the tribe Hesperomyini. The genus is known only from South and Central America, extending north to southern United States.

---

[3] Venezuelan *Hirstionyssus* will be considered elsewhere

As pointed out by Furman and Tipton (1961) and Tipton et al. (1966), there is a great amount of intraspecific variation among *Gigantolaelaps* species. Study of long series of ectoparasites available in the current faunal survey has emphasized this fact. This is reflected in the reduction by synonymy of several previously recognized species and by the recognition of forms, or populations, within species which are distinguishable for the most part only on the basis of non-meristic characters.

Among characteristics which have proved extremely variable at the intraspecific level, at least in some species, are size, shape, strength and relative lengths of the setae of coxae I, overall size of idiosoma, shape of sternal and genitoventral plates, angular position of sternal pores and shape of posterior margin of the dorsal plate. Characters which are more reliable at the species level include size of the dorsal plate, which although variable, is more constant than size of idiosoma; relative size of pair of apicodorsal setae of femur I and of femur II, and of proximodorsal setal pair of genu I; leg chaetotaxy; numbers of rows of deutosternal teeth; hypertrichy of sternal and/or dorsal plates.

Nineteen species of *Gigantolaelaps* are recognized, all from the New World. Thirteen of these are recorded here from Venezuela. In addition, *Gigantolaelaps maximus* (Berlese, 1902) and *G. fonsecai* Machado, 1965 are considered as species *insertae cedis*. *G. bahiensis* Lizaso, 1968 and *G. bipilosus*, Lizaso 1968 were synonymized under *G. vitzthumi* by Furman (1971*a*). *G. trapidoi* Lee and Furman, 1970 is a synonym of *G. boneti* Barrera, 1970. This species has not been recorded from Venezuela, but probably occurs there. Its recorded distribution extends from Colombia to Mexico.

Key to Species of *Gigantolaelaps* of the World
Females

1. Tarsus II with very strong, thick spines, the subapical spine 80 μ x 30 μ, over ⅓ as wide as long; posterior seta of coxa II less than 225 μ long; proximal seta of coxa I a slim, acutely tipped spiniform about 90 μ long; seta S5 of dorsal plate anterior to Z5 and posterior to J5; setae of unarmed dorsum very numerous, short, thick spiniforms. Ex *Holochilus brasiliensis*. (Very close or same as *G. barrerai*). .... *G. brachyspinosus* Fonseca, 1935

Tarsus II without thick spines, or if stout they are less than ⅓ as wide as long; combination of other features not as above. 2

2. Femur I with 2 most apical dorsal setae both very long; usually posterior seta of coxa II very long, over 340 μ. Tibia IV with 10 setae 3

Femur I with 2 most apical dorsal setae consisting of a very long seta and a short one about ½ or less as long as the other. Usually posterior seta of coxa II less than 250 μ long. Tibia IV with 11 setae. 9

3. Both setae of coxa I spiniform. Metapodal plates usually almost as large or larger than stigmata. 4

One or both setae of coxa I setiform. Metapodal plates usually much smaller than stigmata 5

4. Sternal plate at level of setae II much wider than length at midline. Distal spiniform seta of coxa I much slimmer than proximal spiniform and tapering evenly to a fine point. .... *G. mattogrossensis* (Fonseca, 1935)

Sternal plate at level of setae II subequal to length at midline. Distal spiniform seta of coxa I only slightly slimmer than proximal spine, not evenly tapered nor ending in fine point. Closely related to *G. mattogrossensis* .... *G. goyanensis* Fonseca, 1939

5. Deutosternal groove with 6 rows of denticles (occasionally 7 rows). Femur II with apicodorsal pair of setae subequal in length or less than 20% different in length 6

Deutosternal groove with 9 to 12 rows of denticles. Femur II with apicodorsal pair of setae of greatly different lengths, 50% or greater difference. 7

6. Proximal seta of coxa I setiform. Sternal plate relatively shallow, over 100 μ wider than long; anteromedian projection a shallow rounded dome. .... *G. tiptoni* Furman, 1971

Proximal seta of coxa I spiniform. Sternal plate relatively long, less than 70 μ wider than long; anteromedian projection quadrate and similar in appearance to that of *G. vitzthumi* .... *G. intermedia* Furman, 1971

7. Setae J5 of dorsal plate very long, about 2/3 as long as setae Z5 .... *G. wolffsohni* (Oudemans, 1910)

Setae J5 of dorsal plate small, about ½ or less as long as setae Z5. 8

8. A larger species with dorsal plate 1560 to 1980 μ long. Sternal plate large and long, usually 350 μ or more long; anteromedian projection strong and quadrate. Proximal seta of coxa I a strong spiniform; distal seta a strong setiform. Longest seta of femur II over 300 μ long .... *G. vitzthumi* Fonseca, 1939

A smaller species with dorsal plate 1490 to 1690 μ long. Sternal plate smaller, usually about 300 μ long; anteromedian projection weaker, rounded and domelike. Proximal seta of coxa I a strong setiform often slightly inflated basally; distal seta piliform. Longest seta of femur II not more than 300 μ long. .... *G. peruviana* (Ewing, 1933)

9. Sternal plate with 1 to 6 shorter accessory setae in addition to usual 3 pairs of sternal setae 10

Sternal plate lacking accessory setae. 13

10. Dorsal plate with numerous accessory setae on posterior half .... *G. aitkeni* Lee and Strandtmann, 1967

Dorsal plate with normal number of setae (38 to 43 pairs). 11

11. Genitoventral plate of reduced width, about 100 μ wide; genital setae about 300 μ long, reaching far beyond posterior margin of plate; unarmed ventral cuticula with about 24 pairs setae. Genu I with long pair of proximodorsal setae (392 and 322 μ). .... *G. striatus* Lee and Strandtmann, 1967

Genitoventral plate 140 to over 170 μ wide at level of genital setae; genital setae usually less than 200 μ long and not usually reaching beyond posterior margin of plate. Unarmed ventral cuticula with about 50 pairs of setae. Genu I with proximodorsal pair of seta consisting of a long seta and a seta of about ½ its length. 12

12. Both setae of coxa I setiform, subequal, or distal seta up to 1.2 x longer than proximal seta, which is 100 to 144 μ long .... *G. oudemansi* Fonseca. Group I

Proximal seta of coxa I an acuminate spiniform, flexible apically, 77 to 112 μ long; distal seta 1.5 to 2 x longer than proximal spine. .... *G. oudemansi* Fonseca. Group II

Proximal seta of coxa I a stout spiniform 48 to 61 μ long; distal seta over twice as long as proximal spine. .... *G. oudemansi* Fonseca. Group III

13. Dorsal plate with marked hypertrichy, over 60 pairs of setae. 14

Dorsal plate usually with not more than 43 pairs of setae, occasionally up to 50 pairs. 16

14. Large species with dorsal plate 1780 to 2000 μ or more long and sternal plate about 400 to 475 μ wide at level of second pair of sternal setae. Dorsal plate with about 66 pairs setae with most of accessory setae in shoulder region. .... *G. guimaraesi* Lizaso, 1968

Smaller species with dorsal plate 1040 to 1600 μ long and sternal plate less than 400 μ wide at level of second pair of sternal setae. Dorsal plate with many accessory setae over entire plate. 15

15. Dorsal plate 1440 to 1538 μ long; posterior third of plate with distinct tapering to relatively narrow extremity so that marginally located setae S5 are well anterior to Z5. Genitoventral plate not reduced; genital setae do not reach posterior margin of plate. .... *G. boneti* Barrera, 1970

Dorsal plate 1040 to 1235 μ long; posterior third of plate broadly rounded; setae S5 and Z5 arise in transverse row or S5 slightly posterior to Z5. Genitoventral plate reduced; genital setae far surpass posterior margin of plate. .... *G. inca* Fonseca, 1960

16. Gnathosomal setae relatively long, subequal to or longer than inner hypostomals. Apical spine of tarsus II subequal to length of proximal seta of coxa I. Seta I of sternal plate separated by only a short distance, about 86 μ. .... *G. barrerai* Fonseca, 1960

Gnathosomal setae relatively short, much shorter than inner hypostomals. Apical spine of tarsus II much shorter than proximal seta of coxa I. Setae of sternal plate separated by 120 to 260 μ. 17

17. Smaller species with dorsal plate 1306 to 1443 μ long. Proximal seta of coxa I less than 125 μ long but appreciably longer than distal seta. Anteromedian projection of sternal plate evident anterior to bases of first sternal setae. .... *G. canestrinii* Fonseca, 1959

Larger species, dorsal plate 1560 to 2310 μ long. Proximal seta of coxa I over 130 μ long, usually much shorter than distal seta, or subequal. Anteromedian projection of sternal plate may or may not be evident anterior to bases of first sternal setae. 18

18. A very large species with dorsal plate over 1950 μ long and 1130 μ or more wide. Gnathosomal setae over 118 μ long. Anteromedian projection of sternal plate lacking or very reduced. .... *G. gilmorei* Fonseca, 1939

Dorsal plate 1640 to 1746 μ long and 950 to 1030 μ wide. Gnathosomal setae less than 115 μ long. Anteromedian projection of sternal plate short but clearly evident. 19

19. Gnathosomal setae 113 μ long. Dorsal plate with about 50 pairs setae; setae J5 - 188 μ long. .... *G. versteegi* (Oudemans, 1904)

Gnathosomal setae 80 to 86 μ long. Dorsal plate with 43 pairs setae; setae J5 - 215 to 242 μ long. .... *G. amazonae*, new species

Gigantolaelaps aitkeni Lee and Strandtmann

Gigantolaelaps aitkeni Lee and Strandtmann, 1967:27.

This species is rather uncommon in Venezuela.

A total of 156 females and 3 nymphs was taken from 11 host specimens. One hundred and forty-eight of the specimens occurred on 9 *Oryzomys capito* taken in the Dto. Federal, Zulia and Yaracuy; 3 specimens on 1 *Oryzomys* sp. in Yaracuy; 5 specimens on 1 *Monodelphis brevicaudata* from Yaracuy. In extensive collections of ectoparasites from Venezuela, *G. aitkeni* was encountered only from north central and northwestern parts of the country, usually at elevations of less than 500 m.

Venezuelan specimens agree closely with the original description and figures of this species. Collections from Venezuela, in common with most of those reported by Lee and Strandtmann (1967) from Colombia, Costa Rica and Panama, indicate that *Oryzomys* spp. serve as the common hosts, with other hosts probably limited to casual infestations acquired directly or indirectly from *Oryzomys*.

Gigantolaelaps amazonae, new species

(Fig. 1-7)

All but one of the Venezuelan collections of *G. amazonae* were made in T. F. Amazonas at elevations of 135 to 185 m. Of the 25 females, 1 male and 2 deutonymphs obtained from T.F. Amazonas, 25 were from 5 *Oryzomys concolor*, 3 from 2 *O. bicolor* and 3 from 1 *Oryzomys* sp. Three slightly atypical females were collected on 1 *Rhipidomys* sp. at 1537 m. elevation in the state of Carabobo.

Diagnosis

A large species for the genus, with general appearance of *G. versteegi*, but female with gnathosomal setae shorter, central setae of dorsal plate longer, and dorsal plate bearing only 43 pairs of setae. Male with spermadactyl a thin tubular structure 322 μ long, varying from straight to gently curved in an arc; leg II with prominent, blunt ventral spines on femur, genu, tibia and tarsus, but tarsus II lacking thick, blunt apical spine.

Description

The description of the female of *G. amazonae* is based on the holotype, with data in parentheses indicating range of variation seen in 6 to 13 paratype specimens collected from *Oryzomys* spp.

Female: (Fig. 1-5). Idiosoma 2165 μ long (1770-2280) and 1610 μ wide. *Dorsum.* Dorsal plate 1725 μ long (1640-1746) and 1030 μ wide (950-1030) leaving broad lateral and posterior margins of cuticula uncovered; anterior end tapered cephalad from shoulders over coxae II to narrow apex fused with anterior prolongations of peritremal plates; posteriorly broadly rounded with slight medial concavity (varies from slightly concave to convex posterior margin); setal pattern normal with 43 pairs of setae, relatively long and strong; setal lengths j1 - 102 μ (102-132), j5 - 226 μ (215-242), J5 - 81 μ (75-96), Z5 - 260 μ (242-260); distance between trichopores of setae j5 and z5 - 156 μ (156-172). Dorsal cuticula with many setae, shorter in anterolateral region, 64 μ long, and longest on posterior opisthosoma, 172 μ long. *Venter.* Sternal plate 295 μ long on midline (274-300) and 419 μ wide (381-419) at level of setae II; anteromedian projection produced only slightly beyond trichopores of setae I and with margin straight; lateral margins concave and with densely sclerotized band corresponding to endopodal region of coxae II; posterior margin with concave median area and rounded convex margins posterior to setae III; irregular sclerotized fringe extending beyond actual posterior margin of plate in medial area (variable in extent among paratypes); sternal setae I 274 μ long (274-301) extending to posterior margin of sternal plate and with trichopores separated by 180 μ (156-180); setae III 333 μ long (333-360) and with trichopores separated by 365 μ (355-365); pale areas of sternal plate located anteromedial to setae II and III. Genitoventral plate very slightly dumbbell shaped; length 322 μ (268-322) measured from anterior of genital setae trichopores to posterior margin; maximum posterior width 236 μ (212-236); genital setae 274 μ long (252-279). Anal plate of modified inverted pyriform shape with projecting, angular, anterolateral shoulders; length about 220 μ, width about 250 μ; adanal setae of type series range from about 150 μ to 196 μ long; postanal seta of type series from over 290 μ to 341 μ long. Metapodal platelets smaller than stigmata and irregularly rounded. Tubular peritremes extending to level between coxae I and II; peritremal plates expanded in interspaces between legs, and extending forward to fuse with anterior tip of dorsal plate, turning dorsad in region of coxae I. Ventral cuticula with marginal setae extending posteriorly from region of coxae II, with increasingly wide setose ventral band posteriorly to densely setose coverage of most of opisthogaster; setae shortest and stoutest anteriorly but not spiniform. *Gnathosoma.* Chelicerae normal for genus. Gnathosomal setae 80 μ long (80-86), inner hypostomals 161 μ long (149-166). Deutosternal groove with 6 rows of 1 to 3 denticles each (constant in paratypes). *Legs.* All coxal setae but posterior seta of coxa III setiform; proximal seta coxa I 145 μ long (123-145), distal seta 156 μ long (134-156); posterior seta of coxa II 210 μ long (199-231) reaching only to posterior ⅓ of coxa III; posterior spiniform of coxa III blunt, 75 μ long. Leg I with apicodorsal prominent pair of setae on femur consisting of 1 long and 1 short strong setae, 376 μ long (350-376) and 150 μ long (113-150) respectively; genu I proximodorsal pair of prominent setae consisting of 1 long seta, 317 μ, and 1 short seta, 134 μ (Fig. 4). Femur of leg II with pair of subequal apicodorsal setae about 215 μ long (Fig. 5); tarsus II, in addition to several relatively long setiform setae, bearing strong, short spiniforms in postero-midventral position and similar dorsoapical spine 73 μ long and 16 μ wide; spiniforms acutely tipped apically but usually with tips broken in specimens seen. Except for the presence of 10 setae on genu IV and 11 setae on tibia IV, leg chaetotaxy typical of that described for free-living dermanyssoids by Evans and Till (1965).

MALE: (Fig. 6-7). Idiosoma broadly ellipsoid, 1450 μ long and 1003 μ wide. *Dorsum.* Dorsal plate shape as in female, 1450 μ long and about 865 μ wide; with accessory setae laterally; setae of central area of plate relatively long and overlapping successive setal rows; setal lengths j1 - 86 μ, j5 - 191 μ, J5 - 67 μ, Z5 - 200 μ; distance between trichopores of j5 and z5 - 145 μ. Wide lateral and narrow posterior cuticular areas of body with setae as in female. *Venter.* Holoventral plate entire, of usual shape and with broadly widened ventral area densely covered with about 140 relatively short setae 80 to 112 μ long; sternal setae I 191 μ long and separated by distance of 103 μ, not quite reaching trichopores of setae III which are separated by distance of 233 μ; genital setae 177 μ long. Uncovered lateral and posterior cuticula with numerous setae. *Gnathosoma.* Chelicerae with spermadactyl long, thin, tapering, straight to slightly arcuate, 285 μ long; movable digit about 190 μ long, thin, and tapering to needle-like, semi-transparent tip; fixed digit about 170 μ long, narrowly attenuated and with prominent medial seta on shaft about 12 μ from base. Deutosternal groove indistinct, bearing 5 or 6 rows of denticles. *Legs.* Coxal setae, with exception of posterior seta of coxa III, setiform. Posterior setae of coxa II 145 μ long, not extending to midcoxa III. Posterior spiniform seta of coxa III 55 μ long and 13 μ wide. Femur I with apicodorsal pair of setae 340 and 124 μ long respectively; genu I with proximodorsal pair of setae 322 and 113 μ long respectively. Femur II with apicodorsal pair of setae subequal. Leg II with several prominent stout striated, blunt spines: a single ventral one on each of femur, genu and tibia, and 2 ventral ones on tarsus arising basally and medially; subapical whorl of tarsal setae typically tapered setiforms

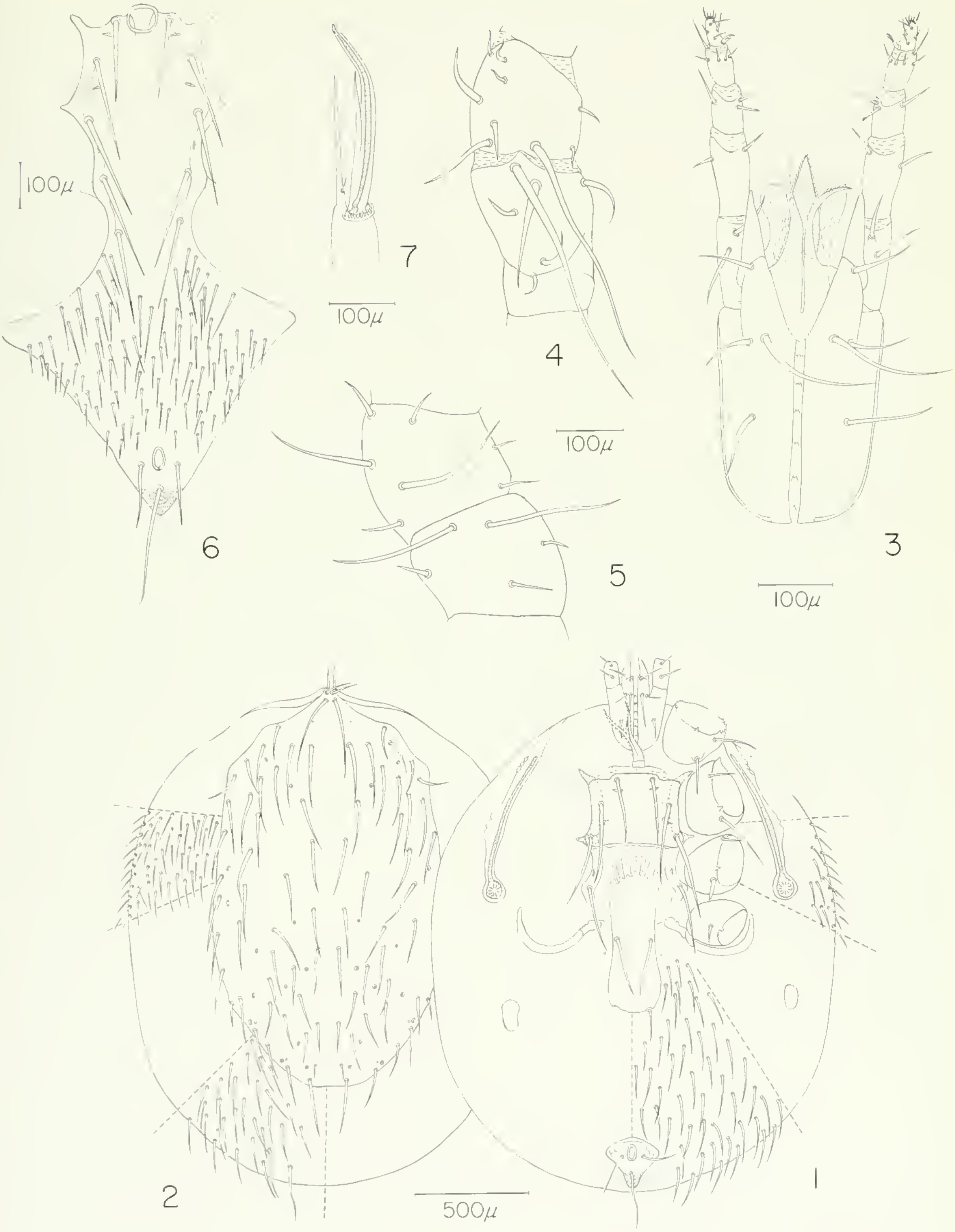


Fig. 1-7. *Gigantolaelaps amazonae,* new species: 1, ventral view of female idiosoma; 2, dorsum of female idiosoma; 3, ventral view of female gnathosoma; 4, dorsum of femur and genu of right leg I of female; 5, dorsum of femur and genu of right leg II of female; 6, holoventral plate of male; 7, cheliceral digits of male.

but 1 dorsal seta of the whorl stronger than others. Leg chaetotaxy differs from ♀ in having only 9 setae on genu IV.

Type Data: Female holotype, male allotype and 1 female paratype were collected from *Oryzomys concolor* Wagner (SVP 17720), Río Mavaca, about 108 km SE Esmeralda, T.F. Amazonas, Venezuela, 10-IV-67, by the M. D. Tuttle team. Four additional paratypes were taken in 4 collections from the same host species as above, at Boca Mavaca, 84 km SE Esmeralda, T. F. Amazonas, 138 m elev., 1 paratype was taken from *O. concolor* at Tamatama, Río Orinoco, T. F. Amazonas; 3 paratypes were taken from 2 *O. bicolor* on the west side of the Río Manapiare near San Juan, T. F. Amazonas.

G. amazonae is closely related to *G. versteegi* (Oudemans) and it was only separated from the latter species through examination of Oudemans' type material during the current study. In the female of *G. amazonae* the gnathosomal setae are consistently 80 to 86 μ long as compared to 113 μ in *G. versteegi;* the dorsal plate bears only 43 pairs of setae instead of approximately 50 pairs, and setae j5 are 204 to 242 μ long instead of 188 μ long. Leg II in the male of *G. amazonae* has much larger, blunt, ventral spines, and tarsus II lacks a blunt, curved, apical spine which is present in *G. versteegi*. The holoventral plate is entire in *G. amazonae*, a characteristic not now discernable in the type of *G. versteegi* but originally described and illustrated as divided by Oudemans.

G. amazonae females share with *G. gilmorei* large body size, similar size and arrangement of dorsal setae on femora and genua of legs I and II, reduced anterior projection of the sternal plate and general facies. They are separable on the basis of characters given in the key, and the males additionally are separable in that the femur of leg II of *G. amazonae* has only 1 ventral stout blunt spine rather than 2 and the spermadactyls are 285 μ long rather than 500 μ long.

It is intriguing to note that the most common host recorded in Venezuela for 3 related species of mites, *G. amazonae*, *G. gilmorei* and *G. canestrinii*, is *O. concolor*. *G. amazonae*, however, was the only one of the 3 species taken from T. F. Amazonas, and with the exception of a single, somewhat atypical series taken from *O. bicolor* in Carabobo state, its recorded distribution was limited to T. F. Amazonas.

The atypical forms of *G. amazonae* from *O. bicolor* differ from those of other collections in smaller size, dorsal plate only 1560 to 1610 μ long, and in having the proximal seta of coxa 1 slightly longer than the distal seta rather than the reverse.

Gigantolaelaps canestrinii Fonseca

(Fig. 8)

Gigantolaelaps canestrinii Fonseca, 1959:158.—Furman, 1971*a*:79 [redescription].

A total of 456 females, 3 males, 2 nymphs and 2 larvae of *G. canestrinii* was taken in Venezuela from 54 positive host specimens. The most commonly infested host was *Oryzomys bicolor*, but *O. concolor* was a fairly frequent host, and occasional infestations occurred on a variety of other hosts. On the most common host, the average intensity of infestation was over 10 *G. canestrinii* per host. Collections from 20 positive *O. concolor* were made in Bolivar, Monagas, Apure and Trujillo states at elevations ranging from 36 to 324 m. Collections from 24 *O. bicolor* were made in Sucre, Bolivar, Trujillo, Monagas, Apure states and on the Yaracuy-Carabobo border at elevations of 4 to 850 m. Although the majority of *G. canestrinii* occurred on hosts at relatively low elevations, occasional hosts were infested in high, temperate zone areas, including 1 female specimen at 3565 m elevation in Merida state from *Thomasomys laniger*. Other hosts found infested on 1 or 2 occasions included *O. minutus*, *O. albigularis*, *Zygodontomys brevicauda*, *Holochilus brasiliensis*, and *Sigmomys alstoni*.

In addition to characters recorded previously for this species, I note that in Venezuelan specimens, the deutosternal groove has 6 rows of denticles and femur II bears a pair of prominent subequal, dorsoapical setae approximately 170 μ long.

Specimens seen from Venezuela vary somewhat from the lectotype of *G. canestrinii* redescribed by Furman (1971*a*). Venezuelan specimens have a sternal plate relatively longer in relation to the width (Fig. 8) than in the lectotype; the length on the midline varies from 11 μ shorter, to 22 μ longer than the width at the level of sternal setae II. In the lectotype the plate is 27 μ shorter than the width. Variations in length of the plate are associated with the degree to which 2 posterior marginal projections extend beyond the plate margin. In *G. canestrinii* this appears to be a highly variable intraspecific character. Venezuelan specimens also have a somewhat larger genitoventral plate than that of the lectotype.

G. canestrinii is very closely related to *G. barrerai*, which may eventually prove to be synonymous with it. Based on an examination of types of these species, however, they are distinguishable in that *G. barrerai* has much stronger spines on tarsus II, the gnathosomal setae are slightly longer than the hypostomal setae, and the posterior seta of coxa III is subequal to the seta of coxa IV instead of being much larger as in *G. canestrinii.* These characteristics may prove to be variable to the point of complete overlap, however. Although more series of *G. barrerai* are needed to clarify the above point, specimens of *G. canestrinii*, as noted earlier, vary widely in the length-width relationship of the sternal plate. In this character the Venezuelan specimens agree more closely with the type of *G. barrerai* than with the lectotype of *G. canestrinii.*

Gigantolaelaps gilmorei Fonseca

(Fig. 9 and 10)

Gigantolaelaps gilmorei Fonseca, 1939*a*:22.

There are 2 slightly different forms of this species from Venezuela, as discussed below, but they are so close that I designate them here only as forms A and B.

Form A was most commonly found on *Oryzomys concolor.* From 16 positive specimens of this host, 79 females and 3 males were collected; hosts were taken at 60 to 2095 m elevation in the Dto. Federal and the states of Monagas, Miranda, Zulia, Trujillo and Bolivar. The remaining 17 specimens of form A were taken from the same areas listed above on 1 or 2 occasions each, from *O. macconnelli*, *Oryzomys* sp., *Akodon urichi*, and from bats.

Form B was collected infrequently; 12 females were taken on 3 *Oryzomys capito* in the Dto. Federal, and Yaracuy state at about 400 m elevation and 1 female on *Oryzomys* sp. in Yaracuy at 400 m. Remaining collections consisted of 2 females from 1 *Monodelphis brevicaudata* at 402 m in Yaracuy and 13 females from 1 *Oryzomys capito* at 1131 m in Zulia.

The female of form A agrees closely with Fonseca's original description. In common with form B it shares the following characteristics: it has 6 to 7 rows of deutosternal denticles; the apicodorsal pair of prominent setae of femur I consists of a very long seta about 400 μ long or more, and a seta less than half as long, 148 to 188 μ long; the apicodorsal pair of setae of femur II are nearly subequal, 210 to 260 μ long; both forms A and B have relatively long gnathosomal setae, over 118 μ long, in contrast to those of the closely related *G. amazonae*, which are about 80 to 86 μ long.

The female of form A differs from form B in its smaller size; the dorsal plate of the former is 1955 to 2035 μ long as contrasted with 2225 to 2310 μ long in the latter; in form A (Fig. 9) the first pair of sternal plate setae are set posterior to the margin of the very short, unpigmented, anterior median projection of the plate, while in form B (Fig. 10) this projection is lacking and the setae arise on the anterior margin; in form A the genital setae extend over ¾ of the distance to the posterior margin of the genito-ventral plate (Fig. 9), whereas in form B the setae are much more delicate and shorter, reaching only ½ the distance to the posterior margin of the plate (Fig. 10).

Gigantolaelaps goyanensis Fonseca

(Fig. 11)

Gigantolaelaps goyanensis Fonseca, 1939*a*:32.—Furman, 1971*a*: 78 [redescribed].

Gigantolaelaps strandtmanni Fonseca, 1959: 156.—Lee, 1966:22 [syn.].

Gigantolaelaps goyanensis was found commonly in Venezuela on *Nectomys squamipes*, and one to 3 times each from a variety of other hosts. Of a total of 519 female, 20 male and 7 nymphal specimens from 57 infested hosts, 384 were taken from 41 *N. squamipes* in the states of Bolivar, Apure, T. F. Amazonas, Tachira, Monagas, Zulia and Barinas at elevations of 24 to 2400 m, although most were collected at less than 100 m elevation. Other occasional hosts included *Nectomys alfari*, *Rattus* sp., *Proechimys semispinosus*, *Heteromys anomalus*, *Oryzomys minutus* and *Zygodontomys brevicauda.*

Venezuelan female specimens of *G. goyanensis* are slightly larger than the holotype measurements given by Furman (1971*a*), the dorsal plate varies from 1655 to 1815 μ long, as compared to 1605 μ in the holotype. The posterior margin of the dorsal plate varies from convex to definitely concave. The sternal plate (Fig. 11) varies from slightly wider than long to slightly longer than wide. Other variations in measurements are minor and within the range considered normal for the species, as are those described above. In addition to the features described by Fonseca (1939*a*) and Furman (1971*a*), the following are noted: the apicodorsal pair of setae of femur II consists of 1 long seta (PD1) about 400 μ in length and 1 relatively short seta (AD1) about 118 μ long; genu II bears dorsally 1 seta 116 μ long, much longer than the remaining 5 dorsal setae; on the dorsal plate setae J5 usually arise in line with setae S5.

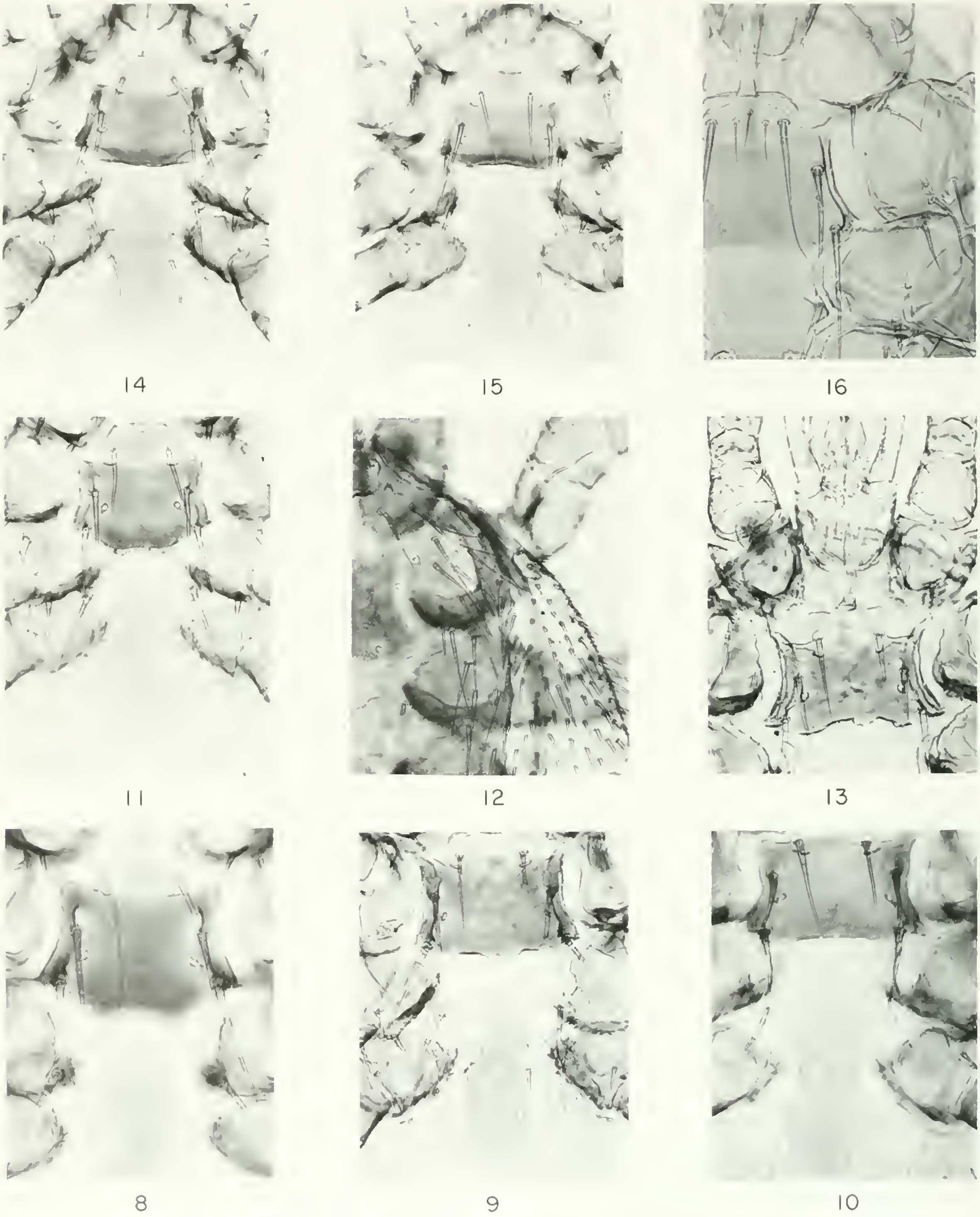


Fig. 8-16. 8, *Gigantolaelaps canestrinii* Fonseca: sternal plate of female from *Oryzomys bicolor*, Trujillo state, X160. 9, *Gigantolaelaps gilmorei* Fonseca, Form A: sternal and genitoventral plates of female from *Oryzomys concolor*, Miranda state. 95X. 10, *Gigantolaelaps gilmorei* Fonseca. Form B: sternal and genitoventral plates of female from *Oryzomys capito*, Yaracuy state, 95X. 11, *Gigantolaelaps goyanesis* Fonseca: anteroventral view of female from *Nectomys squamipes*, Bolivar state, 95X. 12-13. *Gigantolaelaps guimaraesi* Lizaso, from *Oryzomys concolor*, Apure state, 107X: 12, anterodorsal view of female; 13, anteroventral view of female. 14, *Gigantolaelaps intermedia* Furman: anteroventral view of holotype female from *Neacomys tenuipes*, Dto. Federal, 95X. 15, *Gigantolaelaps mattogrossensis* (Fonseca): anteroventral view of female from *Holochilus brasiliensis*, Apure state. 95X. 16. *Gigantolaelaps oudemansi* Fonseca. Form 1: anteroventral view of female from *Oryzomys bicolor*, Bolivar state, 160X.

Gigantolaelaps guimaraesi Lizaso

(Fig. 12 and 13)

Gigantolaelaps guimaraesi Lizaso, 1968:253.—Furman, 1971*a*:86 [redescribed].

A single collection of 2 females was made from *Oryzomys concolor* taken 46 km NE Pto. Paez in Apure state at 76 m elev.

The specimens are somewhat smaller than the holotype of *G. guimaraesi*, the dorsal plate being only 1780 μ long as opposed to 2070 μ. Aside from correspondingly smaller measurements of sclerotized shields and setae, the general facies and relative proportions of structures agree closely with those of the holotype. The anterolateral margins of the dorsal plate exhibit an irregularity (Fig. 12) which suggests that a considerable difference might be found in numbers of accessory setae incorporated in the plate in different specimens. Although the majority of accessory setae are found on the anterolateral margins of the dorsal plate, there is a pair of accessory submedian setae between setae j4 and j5, in the position occupied by a single submedian seta in the holotype. These and other accessory setae of the dorsal plate are interpreted as being variable in position and number.

Lizaso (1968) places *G. guimaraesi* close to *G. gilmorei*, with which I agree, but its appearance is even closer to that of *G. versteegi*. It shares with both species a similar size and arrangement of setae on femora and genua I and II and in having only 6 rows of deutosternal teeth. The sternal plate of Venezuelan specimens of *G. guimaraesi* appears to have a more prominent anteromedian projection than the other 2 species, but this is due mainly to rather deep invaginations of the anterior margin of the plate lateral to the insertions of the first pair of sternal setae (Fig. 13).

Gigantolaelaps inca Fonseca

Gigantolaelaps inca Fonseca, 1960*b*:11.—Furman, 1971*a*:84 [redescribed].

Gigantolaelaps inca was the most commonly encountered species of the genus in Venezuela. A total of over 4000 specimens was taken from 275 hosts. Most of the mites were females, as expected with a nidicolous species, but included were 22 males, 3 nymphs and 13 larvae. By far the most common host was *Oryzomys albigularis;* from 220 infested specimens of this host there were collected 3,810 *G. inca.* Most of the 29 other species of animals found infested are considered only as accidental hosts. Those hosts found infested 4 or more times were *O. minutus* (5), *Rhipidomys venustus* (6), *Heteromys anomalus* (5), *Akodon urichi* (5). *G. inca* in Venezuela seems confined essentially to mountainous areas of the north and west between elevations of 1050 and 3300 m. States of most common occurrence listed in decreasing order of incidence were Dto. Federal, Merida, Trujillo, Aragua, Tachira, Miranda and T. F. Amazonas.

Specimens of *G. inca* agree well with Fonseca's original description as well as that of Furman and Tipton (1961). In addition to characters previously recorded, the following are noted for the species: there are 6 rows of deutosternal teeth, femur II has 2 prominent, apicodorsal, subequal, long setae; genu II has 1 relatively long dorsal seta, plus 5 other dorsal setae, all but 1 of which are very short.

G. inca is distinct from the closely related *G. boneti* Barrera, 1970 (= *G. trapidoi* Lee and Furman 1970) as noted in the key to species. The latter has not yet been recorded from Venezuela, but its recorded hosts include *Oryzomys albigularis*, and its known geographic range extends from Colombia to Mexico.

Gigantolaelaps intermedia Furman

(Fig. 14)

Gigantolaelaps intermedia Furman, 1971*b*:709.

A total of 110 female and 2 male *G. intermedia* was identified from 25 positive host specimens collected in north central and northwestern Venezuela. The mite occurred most commonly on *Neacomys tenuipes*, but single collections of 1 to 10 mites each were recorded from *Oryzomys albigularis*, *O. minutus*, *O. fulvescens* and *O. concolor*.

G. intermedia is closely related to *G. tiptoni*, a common parasite of *O. minutus*, but also occasionally found on *N. tenuipes*. Females of *G. intermedia* are separable from *G. tiptoni* in that the sternal plate is deep in relation to width (Fig. 14 and 21); the anteromedian projection of the sternal plate is quadrate and similar in appearance to that of *G. vitzthumi* instead of a shallow rounded dome as in *G. tiptoni;* all coxal setae are spiniform, with the exceptions of the distal seta of coxa I and posterior seta of coxa II; by contrast in *G. tiptoni* all coxal setae except the posterior seta of coxa III are setiform; the ventral opisthosoma of *G. intermedia* is more densely setose than in *G. tiptoni.*

Females of *G. intermedia* are separable from the related species *G. peruviana*, *G. vitzthumi* and *G. wolffsohni* in having only 6 to 7 rows of deutosternal teeth instead of 9 (rarely 8) to 12 rows, and in having the apicodorsal pair of setae of femur II subequal and of moderate length instead of having 1 seta of this pair 2 to 3 times as long as the other. As a further distinction from *G. wolffsohni*, setae J5 of *G. intermedia* are less than ½ as long as setae Z5, while in Oudemans' species J5 is ⅔ or more as long as Z5.

Gigantolaelaps mattogrossensis (Fonseca)

(Fig. 15)

Macrolaelaps mattogrossensis Fonseca, 1935*a*:22.

Gigantolaelaps mattogrossensis, Fonseca, 1939*a*: 41.—Furman, 1971*a*:77.

Gigantolaelaps cricetidarum Morlan, 1951: 274.—New syn.

Gigantolaelaps mattogrossensis was encountered rarely in Venezuela. Fifty-three females and 1 male were taken from 10 *Holochilus brasiliensis* at elevations ranging from 18 to 1111 m in the states of Monagas, Carabobo and Apure. A single female each was taken from *Sigmodon hispidus* in Carabobo at 1091 m and from *Marmosa robinsoni* in Falcon at 13 m.

Venezuelan specimens of *G. mattogrossensis* agree well with the holotype specimen as studied by Furman (1971*a*). There is some range of variation in characteristics, as for example in size of the dorsal plate, which ranges in length from 1482 to 1610 μ. Similarly the shape of the posterior margin of the dorsal plate varies from convex to definitely concave. In addition to characters previously recorded, the following comments apply to Venezuelan specimens: the deutosternal groove bears 9 to 12 rows of denticles. Femur I bears a subequal pair of prominent apicodorsal setae (AD1 and PD1) about 400 μ long. Genu I bears a prominent, long, proximodorsal seta (PD3) about 360 μ long and an associated shorter seta (AD3) about 145 μ long. The apicodorsal pair of setae of femur II consists of 1 long seta (PD1) of about 350 μ and a relatively short one (AD1) of about 115 μ. Genu II has 1 prominent dorsal seta of about 150 μ length, relatively long in comparison to the other 5 dorsal setae of the segment.

G. mattogrossensis differs from the closely related *G. goyanensis* in possessing a sternal plate (Fig. 15) which is much wider at the level of the second pair of sternal setae than the length at midline, and although there is considerable variation in size of coxal setae, those of coxa I are usually less stoutly spiniform and more acutely pointed than in *G. goyanensis*.

In Venezuela *G. mattogrossensis* is associated closely with *Holochilus brasiliensis*, while *G. goyanensis* is common only on *Nectomys squamipes*.

Comparison of a paratype of *G. cricetidarum* with the holotype of *G. mattogrossensis* as well as with Venezuelan specimens of the latter provided no basis for distinguishing between these forms. *G. cricetidarum* is declared a synonym of *G. mattogrossensis*.

Gigantolaelaps oudemansi Fonseca

(Fig. 16-18)

Gigantolaelaps oudemansi Fonseca, 1939*a*:15 and 64.—Furman, 1971*a*:85.

There are 3 general morphological forms of *G. oudemansi* with occasional overlap between 2 of the forms.

A total of 627 specimens of *G. oudemansi* was identified from 87 infested hosts in Venezuela. Of these, 76 females, 1 deutonymph and 2 larvae are designated as form I. Form I was collected from each of 4 *Oryzomys concolor*, 3 *O. capito* and 1 *O. macconnelli* in T. F. Amazonas; from 4 *O. bicolor* in T. F. Amazonas, Carabobo and Bolivar states; and from 1 *Akodon urichi* in the state of Bolivar. No host information is available for the remaining collection of 3 females. Collections were made at elevations of 135 to 1537 m.

Form II was represented by 88 females taken on 27 infested hosts. It occurred on 11 *O. concolor* collected in descending order of frequency in the states of Bolivar, Monagas, Apure and Trujillo; from 14 infested *O. bicolor* it was taken in the states of Sucre, Apure, Trujillo and the border of Yaracuy and Carabobo. A single collection each was made from *O. albigularis* in Dto. Federal and from *Rhipidomys* sp. in Guarico. Most collections were made at low elevations, but recorded elevations ranged from 4 to 2151 m.

Form III was represented by 457 females, 1 male and 2 deutonymphs taken on 46 infested hosts. It occurred on 27 *O. concolor* collected in descending order of frequency in the Dto. Federal, and states of Miranda, Monagas, Bolivar, Trujillo and Zulia. Other hosts found infested were 1 *Oryzomys* sp. and 4 *O. capito* in Bolivar, Monagas and T. F. Amazonas, 2 *O. macconnelli* in Bolivar state, 3 *O. albigularis* in Aragua, Bolivar and Dto. Federal, 3 *Rhipidomys venustus* in Merida state and Dto. Federal, 1

R. venezuelae in Bolivar and 1 *Akodon urichi* in Tachira. Form III was collected on hosts at elevations ranging from sea level to 3130 m.

Neither host records nor geographic distribution provide a sound basis for distinguishing between the 3 forms of *G. oudemansi*, although form II was taken only in the northern ⅔ of Venezuela. *O. concolor* was a common host of all 3 forms, with form III being the most frequently encountered. *O. bicolor* also harbored forms I and II.

Form I is of variable size, with a dorsal plate ranging from 1200 to 1680 μ long. The proximal seta of coxa I is an evenly tapered setiform 100 to 144 μ long; the distal seta of coxa I is only slightly longer than the proximal seta (Fig. 16).

Form II has a dorsal plate ranging from 1285 to 1420 μ long. The proximal seta of coxa I is a stout spiniform 48 to 61 μ long; the distal seta of coxa I is over twice as long as the proximal spiniform seta (Fig. 17).

Form III is somewhat intermediate between forms I and II. The dorsal plate varies from 1160 to 1600 μ long. The proximal seta of coxa I is an acuminate spiniform, flexible apically, 77 to 112 μ long; the distal seta of coxa I is 1.5 to 2 times longer than the proximal spiniform seta (Fig. 18).

Based on the restudy of Fonseca's holotype of *G. oudemansi* reported by Furman (1971*a*), in comparison with the currently recorded specimens from Venezuela, a rediagnosis of the female of the species is given.

A small to medium sized species for the genus, with idiosoma 1220 to 1900 μ long. Dorsal plate bluntly ovoid, usually leaving wide margins of the idiosoma uncovered laterally and posteriorly, measuring 1190 to 1670 μ long by 700 to 935 μ wide; bearing 43 to 44 pairs setae. Sternal plate with 3 to 6 relatively small accessory setae located anteriorly. Genital setae variable but usually reaching about to posterior margin of genitoventral plate. Coxa I with proximal seta varying from a long setiform almost as long as the distal seta, to a stout spiniform less than ½ the length of the distal seta. Femur I with 2 prominent apicodorsal setae, 1 of which is 2 or more times longer than the other. Coxa II with long posterior seta varying from 150 to 307 μ. Deutosternal groove bearing 6 rows of denticles.

G. oudemansi is closely related to *G. aitkeni* Lee and Strandtmann from which it differs in lacking hypertrichy of the dorsal plate. *G. striatus* Lee and Strandtmann is also closely related to *G. oudemansi*, but differs in having a short, narrow genitoventral plate with genital setae far surpassing the posterior border.

Gigantolaelaps peruviana (Ewing)

(Fig. 19 and 20)

Macrolaelaps peruvianus Ewing, 1933:7.

Gigantolaelaps peruvianus, Fonseca, 1939*a*:10 and 60.

A total of 115 females and 1 deutonymph of *G. peruviana* was identified from 62 positive host specimens collected in Dto. Federal and the states of Monagas, Bolivar, Sucre, Carabobo, Falcon, Miranda, and T. F. Amazonas. The majority of specimens were taken from *Oryzomys fulvescens* in the states of Monagas, Bolivar, Falcon, Carabobo and Sucre. Collections from other hosts were rare and are considered accidental associations. Collections of positive hosts were made at elevations ranging from sea level to 1770 m.

In the past, considerable confusion has arisen in distinguishing between *G. peruviana* and the closely related *G. wolffsohni*. Furman and Tipton (1961) and Tipton et al. (1966) considered *G. peruviana* a synonym of *G. wolffsohni*. Comparison of cotypes of the former with type material of Oudemans demonstrates differences between the 2 species which appear to be constant in specimens currently reported from Venezuela.

Redescription

The following redescription of the female of *G. peruviana* is based on study of 2 of Ewing's cotypes No. 1072, followed in parentheses by corresponding data from 10 female specimens collected in Venezuela; idiosomal length 1825 μ (1540 to 1870). Dorsal plate 1690 μ long (1490 to 1585) and 1042 μ wide (930 to 1020); posterior margin markedly concave on 1 cotype and slightly concave on the other (slightly concave to slightly convex on Venezuelan specimens); setae j5 - 215 μ long (199 to 226), longer than distance between bases of setae j5 and z5; setae J5 - 107 μ long (75 to 107); setae Z5 tilted and not measured on cotypes (215 to 274 μ long in Venezuelan specimens) (Fig. 19). Sternal plate length at midline 276 μ (295 to 322); width at level of setae II 354 μ (376 to 408); shape of plate as given in Fig. 20. Sternal setae I 279 μ long (295 to 360); setae III 349 μ long (344 to 408); distance between bases of setae I 115 μ (124 to 140); distance between bases of setae III 338 μ (381 to 424). Genitoventral plate 245 μ long (242 to 279) measured from level of genital setae trichopores to posterior end of plate, and with maximum posterior width of 247 μ (226 to 285), slightly expanded posteriorly (slight to no posterior expansion); genital setae 279 μ long (284 to 327), extending well beyond posterior margin of plate. Anal plate of inverted pyriform shape, 268 μ long (209 to 236) and 220 μ wide (199 to 236); adanal setae 167 μ long (156 to 215); postanal seta broken in cotypes (252 to 295 μ long). Ventral opisthosomal cuticula with numerous setae, longer posteriorly to greatest length of 268 μ. Gnathosomal setae 92 μ long (85 to 93); inner hypostomal setae 134 μ long (126 to 161). Deutosternal groove with 9 rows of denticles (8 to 12 rows, rarely as few as 8 rows). Legs with proximal seta of coxa I a slim, stiff spiniform 80 μ long (94 to 120) and 14.5 μ wide (12 to 16 μ wide, in Venezuelan specimens varying from slim spiniform to setiform with slightly swollen base); distal seta slender setiform, 111 μ long (125 to 140). Posterior seta of coxa II 350 μ long (322 to 392) reaching to mid-level of coxa IV. Femur I with 2 apicodorsal, prominent, long subequal setae 383 and 350 μ long (360 to 430 and 349 to 403). Genu I with 1 long and 1 short proximodorsal setae 337 and 134 μ long. Femur II with apicodorsal pair of setae grossly unequal, 1 member of the pair about 2 or more times longer than the other (as in Venezuelan specimens).

It is apparent that there is a great deal of variation in *G. peruviana*, but diagnostic features are found as follows: a pair of prominent, long, subequal, apicodorsal setae on femur I, and in a similar position on femur II a pair of prominent setae which are grossly unequal; the presence of 9 to 12 (rarely 8) rows of deutosternal denticles; a short pair of posterior subterminal setae (J5) on the dorsal plate, which are less than ½ as long as setae Z5. The latter represents the best single diagnostic criterion for distinction from *G. wolffsohni*, in which setae J5 are very long, ⅔ or more as long as setae Z5.

It seems quite possible that *G. peruviana* and *G. wolffsohni* may intergrade completely, but specimens so far examined are readily distinguishable. In this respect it is of interest to note that in Venezuela both typical *G. wolffsohni* and the more frequently encountered *G. peruviana* were taken most commonly from *O. fulvescens*.

Distinguishing characters separating *G. peruviana* from *G. tiptoni* and *G. intermedia* are given in the discussion of those species.

The species name *G. peruvianus* is emended here to *G. peruviana* since the generic name is of feminine gender.

Gigantolaelaps tiptoni Furman

(Fig. 21)

Gigantolaelaps tiptoni Furman, 1971*b*:707.

Two hundred and thirteen females and 1 male *G. tiptoni* were identified from 123 host specimens collected in various parts of Venezuela. *Oryzomys minutus* was the only host commonly infested, with occasional, or single collections recorded from *O. fulvescens*, *Neacomys tenuipes*, *Cryptotis thomasi*, *Mus musculus* and *Marmosa dryas*. Most collections were made at elevations of 2000 to 4000 m. Infested hosts were collected in Dto. Federal and the states of Merida, Tachira, Trujillo, Monagas, Sucre and Yaracuy.

G. tiptoni is closely related to *G. intermedia*. See the discussion of the latter species for distinction of the species. It is also separable from the related species, *G. peruviana*, *G. vitzthumi* and *G. wolffsohni* by the same features used in separating these species from *G. intermedia*.

Gigantolaelaps versteegi (Oudemans)

(Fig. 26 and 27)

Laelaps versteegii Oudemans, 1904:223.

Gigantolaelaps versteegi, Fonseca, 1939*a*:11 and 61.

Through the courtesy of Dr. L. van der Hammen it was possible to study type material of both sexes of *G. versteegi* deposited in the Rijksmuseum van Natuurlijke Historie. Oudemans' original description, excellent though it was, left several critical features in doubt. The following supplementary redescription of the type material is given to clarify these features. The type female is mounted with 2 other females from the same collection on a single slide, with the type indicated as the largest of the 3. The following data pertain to the type female unless otherwise indicated.

Redescription

Female: Idiosoma 2040 μ long. Dorsal plate 1720 μ long and 1003 μ wide, broadly rounded, convex posteriorly, narrowed anteriorly, with shoulders over coxae II; setae somewhat longer than figured by Oudemans; setae j5 missing in type but 188 μ long in specimens on same slide, extending past bases of setae z5;

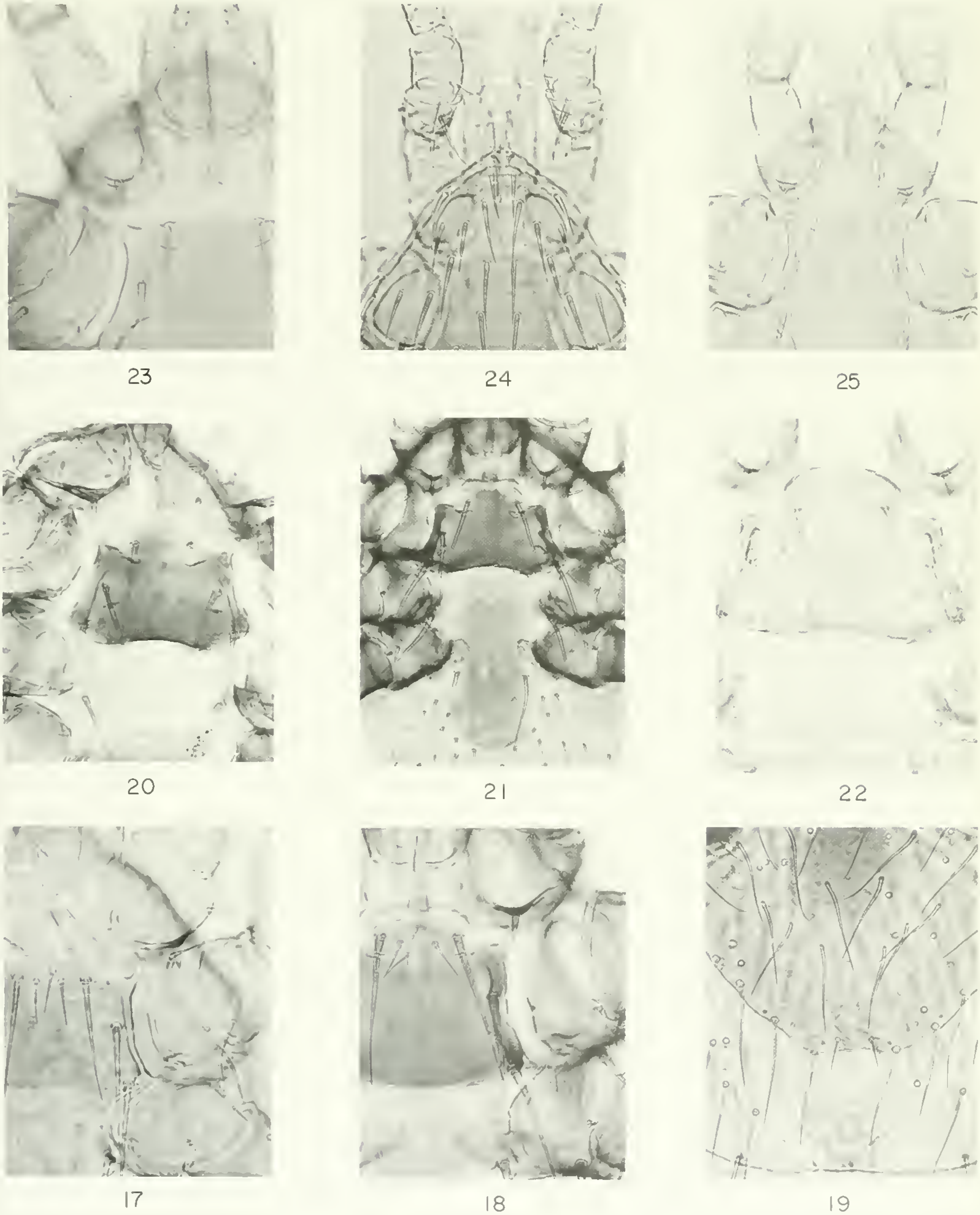


Fig. 17-25. 17-18, *Gigantolaelaps oudemansi* Fonseca: 17, Form II, anteroventral view of female from *Oryzomys concolor*, Monagas state, 160X; 18, Form III, anteroventral view of female from *Oryzomys concolor*, Dto. Federal 160X. 19-20, *Gigantolaelaps peruviana* (Ewing): 19, posterior end of dorsal plate of female from *Oryzomys fulvescens*, Monagas state, 126X; 20, anteroventral view of cotype female, Peru 126X. 21, *Gigantolaelaps tiptoni* Furman: anteroventral view of female from *Oryzomys minutus*, Merida state, 95X. 22, *Gigantolaelaps wolffsohni* (Oudemans): sternal plate of type female, 160X. 23, *Laelaps acuminata* Furman: anteroventral view of female from *Oryzomys concolor*, Dto. Federal, 400X. 24-25, *Laelaps crinigera* Furman, female from *Oryzomys concolor*, T. F. Amazonas, 272X: 24, anterodorsal view; 25, anteroventral view.

posterior subterminal setae J5 - 85 μ long; posterior terminal setae Z5 - 245 μ long, longest setae of body; total number of dorsal plate setae obscure in type but about 50 pairs visible in 1 of original type series. Sternal plate 269 μ long on midline and 381 μ wide at level of setae II, shape as figured by Oudemans for the type but variable as seen in 1 other specimen on slide, having convexly rounded posterior lateral margins rather than concavities behind setae III (Fig. 26); sternal setae I 269 μ long with trichopores separated by 145 μ; setae III 311 μ long with trichopores separated by 365 μ; pale areas subtend anteriorly trichopores of setae II and III of type female. Genitoventral plate 311 μ long measured from trichopores of genital setae to posterior margin; plate very slightly expanded posteriorly, about 220 μ wide at greatest posterior width; genital setae 279 μ long. Adanal setae not distinct in type but about 161 μ long in 1 of other original specimens. Postanal seta about 295 μ long. Ventral opisthosomal cuticula with numerous setae as illustrated by Oudemans. Gnathosomal setae 113 μ long. Inner hypostomal setae 172 μ long. Chelicerae (type chelicera mounted on separate slide) exactly as depicted by Oudemans. Deutosternal groove denticles not visible in type but with 6 rows of denticles visible in 1 of other original specimens. Legs with proximal seta of coxa I 150 μ long, 15 μ wide at base, setiform; distal seta 160 μ long, a very slender setiform. Posterior seta of coxa II longer than other coxal setae but short for the genus, 199 μ long, extending almost to mid-level of coxa III. Posterior seta of coxa III spiniform, 86 μ long and 18 μ wide at base. Femur I with apicodorsal setae indistinct and apparently with 1 member of usual pair of prominent setae broken (illustrated by Oudemans as having 1 long and 1 short apicodorsal setae). Genu I with proximodorsal pair of setae consisting of 1 long and 1 medium length seta. Femur II with 2 prominent apicodorsal setae subequal and of moderate length.

Male: The following data are based on study of the type specimen of the male of *G. versteegi*, dissected and mounted on 3 slides.

Idiosoma 1636 μ long. Dorsal plate 1600 μ long and 907 μ wide. Wide lateral and a narrow posterior margin of uncovered dorsal cuticula bearing many setae. Dorsal plate with accessory setae laterally, longer but slimmer than lateral cuticular setae; setae j1 - 91 μ long; setae j5 broken but longer than distance between trichopores of setae j5 and z5. Setae J5 and Z5 oriented so that measurement impractical, but over 61 and 172 μ respectively. Holoventral plate outline obscured by body residue in opisthosomal region, but lateral emarginations visible in region where Oudemans illustrated complete separation of anal plate from remainder of holoventral plate; present condition of specimen permits no definite confirmation of Oudemans' interpretation; accessory setae of ventral portion of plate about 128 μ long, longer than illustrated by Oudemans. Sternal setae I 204 μ long, reaching bases of setae III, which are 247 μ long; trichopores of setae I separated by 107 μ, of setae III by 258 μ. Gnathosomal setae 61 μ long; inner hypostomal setae 120 μ long, in marked contrast to Oudemans' illustration. Chelicerae as figured by Oudemans, with spermadactyl 260 μ long. Deutosternal groove with 6 rows of 1 to 4 denticles each. Legs with setae of coxa I and posterior seta of coxa II broken. Posterior seta of coxa III a thin spiniform. Femur I with apicodorsal pair of setae consisting of 1 long seta, the other broken. Genu I with proximodorsal pair of setae unequal, 269 and 129 μ long respectively. Leg II with the usual modified ventral spines apparently present but much reduced and consisting of 1 on the femur plus 2 empty trichopores, 1 on the genu, and on the tibia an empty trichopore in normal position of spine (Fig. 27). Tarsus II with several ventral prominent, short, stout, blunt spines including a curved apical spine, several longer straight medial spines and a similar shorter one basally; both medially and distally there are somewhat more slender and pointed spines and setae as illustrated (Fig. 27).

The original collection data given by Oudemans for *G. versteegi* cited the host as a *Mus* sp. collected near the Wilhelmina River in Surinam. No specimens identified as *G. versteegi* were recorded during the present survey of the Venezuelan fauna. The present description is given, however, to differentiate it from the closely related *G. amazonae*, which might have been considered as *G. versteegi* if reliance had been placed only on the original description by Oudemans.

Gigantolaelaps wolffsohni (Oudemans)

(Fig. 22)

Laelaps wolffsohni Oudemans, 1910:147.

Gigantolaelaps wolffsohni, Morlan, 1951:273.

Macrolaelaps butantanensis Fonseca, 1936*a*:21.

Gigantolaelaps butantanensis, Fonseca, 1939*a*:44, 93.—Furman, 1971*a*:83 [redescribed].—New syn.

Gigantolaelaps comatus Fonseca, 1939*a*:39, 87.—Furman, 1971*a*:83. [redescribed].—New syn.

Only 12 females and 1 nymph of this rarely encountered species in Venezuela were taken from 8 positive host specimens in a limited area of northeastern Venezuela. Eleven specimens were collected from 6 *Oryzomys fulvescens* collected 54 km SE Maturin, Monagas at 18 m elev. One was from *Sigmomys alstoni* at the same location, and 1 was from *Mus musculus* collected at Independencia, Bolivar at 824 m elev.

Through the kindness of Dr. L. van der Hammen of the Rijksmuseum van Natuurlijke Historie, it was possible to study the type of *G. wolffsohni* and make comparisons with Fonseca's types of *G. butantanensis* and *G. comatus* which I studied in São Paulo, Brazil. The types of these 3 species vary only in very minor details, as discussed below, and those details by which they differ are almost completely overlapped by the range in variation observed in the currently reported collections from Venezuela.

Collection data provided by Oudemans (1910) for his type material of *G. wolffsohni* indicate merely that the host probably was a small rodent which was captured by Mr. John A. Wolffsohn, resident near Valparaiso, Chile. Fonseca (1936*a*) originally described *G. butantanensis* from an *Oryzomys eliurus* Wagner, caught at Butantã, São Paulo, Brazil. Fonseca (1939*a*) described *G. comatus* from the only known specimen, the female holotype, taken from an unidentified rat at Butantã, São Paulo, Brazil.

REDESCRIPTION

The following description of *G. wolffsohni* is based on study of Oudemans' original material, a female, followed in parentheses by corresponding data from 8 female specimens from the currently reported Venezuelan collections: idiosomal length 1610 μ (1693-1910). Dorsal plate 1556 μ long (1505-1620) and 1000 μ wide (945-1015); posterior margin convex (varying in Venezuelan specimens from a very shallow concavity to a pronounced medial notch); setae j5 - 242 μ long (279 to 295), longer than distance between bases of setae j5 and z5; setae J5 - 166 μ long (156 to 185), ⅔ as long as setae Z5 which are 242 μ long (243 to 274). Sternal plate length at midline 295 μ (301 to 322); width at level of setae II 400 μ (381 to 424); anteromedian projection of sternal plate of type specimen and of Venezuelan specimens more pronounced than figured by Oudemans and with anterolateral angles of plate produced anterolaterally (Fig. 22); sternal setae I 355 μ long (312 to 365), somewhat shorter than sternal setae III; distance between bases of setae I 150 μ (126 to 150); between setae III 418 μ (381 to 425). Genitoventral plate not expanded behind trichopores of genital setae (varies from little to no expansion in Venezuelan specimens); genital setae 295 μ long (306 to 328) extending well beyond posterior margin of plate. Anal plate tipped in type but of inverted, broadly pyriform shape; adanal setae tilted in type but more than 172 μ long (172 to 215); postanal seta 301 μ long (295 to 322). Ventral opithosomal cuticula with many setae, the anterior, more centrally placed setae shorter, about 80 μ long; the more laterally or posteriorly placed setae longer, up to 268 μ long in the type. Gnathosomal setae 85 μ long (86 to 97); inner hypostomal setae 145 μ long (134 to 145). Chelicerae as figured by Oudemans, but minute seta at base of fixed digit not visible. Deutosternal groove with 10 rows of 1 to 2 denticles each (8 to 10 rows of 1 to 3 denticles each). Legs with proximal seta of coxa I a slender seta 110 μ long (103 to 118) and 12 μ wide at base (12 to 14, varying from slender setiform to somewhat swollen toward base); distal seta 140 μ long (124 to 145) and more slender than proximal seta. Posterior seta of coxa II 392 μ long (344 to 419), reaching about to mid-level of coxae IV. Femur I with 2 apicodorsal, prominent, long, subequal setae 510 and 484 μ long (510 to 562 and 456 to 510). On the type specimen the presumably longest proximodorsal seta of genu I is broken (this is a very long seta in Venezuelan specimens, although somewhat shorter than the longest setae of femur I). Apicodorsal setae of femur II are, with 1 exception, broken on the type specimen (Venezuelan specimens have a pair of prominent, grossly unequal, apicodorsal setae on femur II, 1 of which is 2 or more times as long as the other).

Comparable descriptive data based on study of the types of *G. butantanensis* and *G. comatus* were given by Furman (1971*a*). There it was pointed out that *G. comatus* lacks the posterior marginal notch in the dorsal plate, a feature considered diagnostic for *G. butantanensis* by Fonseca. This is now considered as a variable feature and leaves no valid distinctive criteria between the species *G. wolffsohni*, *G. butantanensis* and *G. comatus*.

The resurrection of *Gigantolaelaps peruviana* (Ewing) and its distinction from *G. wolffsohni* are discussed under *G. peruviana*.

Genus *Laelaps* Koch

Laelaps Koch, 1836:19.—Tipton, 1960:260 [generic revision].

Type Species: *Laelaps agilis* Koch, 1836.

The genus *Laelaps* consists of small to large mites with dorsal plate ranging from 450 to 1065 μ long. Female with sternal plate usually broader than long, but ranging to longer than broad; genitoventral plate with 4 pairs of setae. Some coxal setae usually spiniform. Peritremal plates extend posterior to stigmata but not fused with parapodal platelets. Dorsal plate with 39 or more pairs setae. Chaetotaxy of legs I to IV respectively for females of all Venezuelan species as follows: trochanter - 6, 5, 5, 5; femur - 13, 11, 6, 6; genu - 13, 11, 9, 10; tibia - 13, 10, 8, 10. Chelicerae chelate-dentate in females with the movable digit bidentate. Fixed digit in males reduced, edentate; movable digit edentate and partially fused with elongated, grooved spermadactyl. Arthrodial processes at base of movable digit short, setiform. Deutosternum with 6 or rarely 7 rows of denticles, each row with 2 to 5 denticles. Tectum membranous, rounded anteriorly.

The concept of the genus *Laelaps* followed here represents a modification of that given by Tipton (1960), enlarging the scope of the genus to include *Echinolaelaps* Ewing, 1929 as a subgenus. This is in accord with the concept advanced by Strandtmann and Mitchell (1963). *Laelaps* is considered distinct, however, from the related Neotropical genera *Tur*, *Mysolaelaps*, *Steptolaelaps* and *Gigantolaelaps*.

Venezuelan species of *Laelaps* are of common occurrence in the nests and on the bodies of cricetid rodents of the tribe Hesperomyini. Occasional species have been introduced with murid rodents, with which they usually remain rather closely associated. Of the 20 species of *Laelaps* recognized from South America, 16 are recorded here from Venezuela.

Key to South American Species of *Laelaps*

Females

1. Marked hypertrichy of dorsal plate 2
Dorsal plate with 39 to 43.5 pairs setae 4

2. Dorsal plate with approximately 46 to 49 pairs setae. Proximal seta of coxa I a strong acuminate setiform about 8 times longer than wide and about 1¾ times longer than piliform distal seta. Longest dorsal setae of femur and genu I about 44 and 41 μ respectively. Ex *Rhipidomys* ..... *Laelaps surcomata* Furman, 1972
Dorsal plate with 60 or more pairs setae. Proximal seta of coxa I a strong setiform or a weak spiniform 3.5 to 6 x longer than wide and subequal to, or up to 1½ times longer than, stout distal seta. Longest dorsal setae of femur and genu I 65 to 85 and 67 to 110 μ respectively 3

3. Dorsal plate with about 85 to 100 pairs setae; distance between genital setae 109 to 113 μ; 28 to 30 pairs setae on unarmed ventral opisthosoma. Ex *Oryzomys* ..... *Laelaps navasi* Fonseca, 1939
Dorsal plate with 60 to 74 pairs setae; distance between genital setae 70 to 77 μ; about 18 to 24 pairs setae on unarmed ventral opisthosoma. Common on *Calomys hummelincki*, *Calomys* sp. and *Oryzomys eliurus* ..... *Laelaps mazzai* Fonseca, 1939

4. Sternal plate length on midline subequal to or greater than width at level of setae II, or if slightly wider than long, setae Z5 of dorsal plate small, subequal to setae J5 5
Sternal plate length definitely less than width at level of second pair of setae; length/width ratio of plate ranging from 0.50 to 0.84. Setae Z5 of dorsal plate much longer than setae J5 9

5. Setae Z5 of dorsal plate not enlarged, subequal to setae J5. Sternal setae I not reaching bases of setae II. Genitoventral plate setae all short and subequal, not reaching bases of following pairs of setae. Ex *Oryzomys* species ..... *Laelaps spicata* Furman, 1972
Setae Z5 of dorsal plate much larger than setae J5. Sternal setae I extend past bases of setae II. At least genitoventral setae III and IV elongate 6

6. Medium-sized mites with dorsal plate less than 650 μ long; setae Z5 of dorsal plate about 80 μ long. Ex *Oryzomys* species ..... *Laelaps crinigera* Furman, 1972
Large mites with dorsal plate over 900 μ long; setae Z5 of dorsal plate over 110 μ long 7

7. Genitoventral plate with concave posterior margin fitting around convex anterior margin of anal plate. Coxa I with proximal seta setiform and distal seta spiniform. Pilus dentilis knobbed and bent at apex. Ex *Rattus* species ..... *Laelaps* (*Echinolaelaps*) *echidninus* Berlese, 1887

   Genitoventral plate with convex posterior margin. Coxa I with both setae spiniform or with proximal seta spiniform and distal seta setiform. Pilus dentilis setiform, with or without basal inflation 8

8. Femur I with thornlike dorsal spine and blunt posterolateral spine. Anterior margin of sternal plate with median concavity. Genital setae short, extending less than ½ the distance to bases of setae II. Ex *Neacomys tenuipes*, *N. spinosus*, *Sigmodon hispidus*, *Oryzomys fulvescens*, *Oryzomys concolor* and *Heteromys anomalus* ..... *Laelaps* (*Echinolaelaps*) *boultoni* Furman and Tipton, 1961

   Femur I lacking thornlike dorsal spine and blunt posterolateral spine. Anterior margin of sternal plate with median triangular projection. Genital setae long, extending almost to base of setae III. Common on *Rhipidomys macconnelli*. ..... *Laelaps* (*Echinolaelaps*) *conula* Furman, 1972

9. Proximal seta of coxa I setiform and distal seta spiniform. Genitoventral plate with bases of setae I separated by a distance subequal to that between setae IV. Ex *Rattus* species. ..... *Laelaps nuttalli* Hirst, 1915

   Setal pattern of coxa I not as above. Genitoventral plate with bases of setae I more widely separated than bases of setae IV. 10

10. Adanal and postanal setae of subequal strength and length. Ex "wild rat" ..... *Laelaps exceptionalis* Fonseca, 1936

    Postanal seta clearly longer and stronger than adanal setae 11

11. Gnathosomal setae about 73 μ long, about 1¼ times longer than inner hypostomal setae. Sternal plate convex posteriorly. Adanal setae originate well behind posterior level of anus. Common on *Zygodonotomys brevicauda* ..... *Laelaps dearmasi* Furman and Tipton, 1961

    Gnathosomal setae less than 40 μ long, shorter than inner hypostomal setae. Sternal plate concave to sub-linear posteriorly. Adanal setae originate at or anterior to posterior level of anus. 12

12. Both proximal and distal setae of coxa I spiniform 13

    Coxa I with proximal seta setiform or spiniform; distal seta piliform or setiform 14

13. Central setae of dorsal plate reduced, small and delicate (including j4 to 6, J1 to 5, z5 and 6, px2 and 3); j5 about 20 μ long. Proximal spiniform seta of coxa I ⅓ longer than distal seta. Genital seta short, not reaching bases of setae II. Ex *Daptomys venezuelae* ..... *Laelaps manguinhosi calvescens* new subspecies

    Central setae of dorsal plate not reduced; j5 - 39 to 67 μ long. Proximal spiniform seta of coxa I subequal or slightly longer than distal seta. Genital setae longer, extending past bases of setae II. Common on *Holochilus* and *Nectomys* species and occurring on a variety of other rodents ..... *Laelaps manguinhosi manguinhosi* Fonesca, 1936

14. Proximal seta of coxa I a rather coarse setiform, evenly tapered from base to a very fine apex 15

    Proximal seta of coxa I a strong spiniform, or if of intermediate strength, not evenly tapered from base to apex 16

15. A small species, with dorsal plate 502 to 510 μ long. Gnathosomal setae short, 13 to 18 μ long. Proximal seta of coxa I 3.5 to 6 times longer than wide. Central setae of dorsal plate relatively short; setae j5 not extending to bases of setae z5. Common on *Oryzomys albigularis* ..... *Laelaps ovata* Furman, 1972

    A larger species, with dorsal plate about 678 μ long. Gnathosomal setae longer, 32 μ long. Proximal seta of coxa I over 8 times longer than wide. Central setae of dorsal plate longer; setae j5 extend past bases of setae z5. ..... *Laelaps thori* Fonseca, 1939

16. Proximal seta of coxa I with abruptly acuminate, whiplike tip. Common on *Oryzomys concolor* and *Oryzomys bicolor* .... *Laelaps acuminata* Furman, 1972

Proximal seta of coxa I with rounded or abruptly and usually bluntly pointed tip, not acuminate 17

17. Large species with dorsal plate more than 600 μ long; genitoventral plate broadly expanded behind coxae IV, 189 to 280 μ wide. Longest posterior opisthosomal setae over 130 μ long 18

Small to medium-sized species with dorsal plate less than 600 μ long; genitoventral plate less than 170 μ wide at greatest width. Longest posterior opisthosomal setae not over 100 μ long 19

18. Dorsal plate 767 to 981 μ long. Proximal seta of coxa I a narrowly elliptical, bluntly tipped spiniform. Setae of posterior opisthosomal margin stiff and straight. Common on *Rhipidomys* and *Oryzomys* species .... *Laelaps paulistanensis* Fonseca, 1936

Dorsal plate 604 to 654 μ long. Proximal seta of coxa I a stoutly conical spiniform. Setae of posterior opisthosomal margin flexible, often appearing sinuous. Common on *Oryzomys minutus* .... *Laelaps flexa* Furman, 1972

19. Adanal setae arise approximately at posterior level of anus. Long apicodorsal seta on femur of leg I subequal to, or shorter than, long proximodorsal seta of genu. Dorsal plate ranging from 526 to 587 μ long 20

Adanal setae arise well anterior to posterior level of anus. Long apicodorsal seta on femur of leg I longer than long proximodorsal seta of genu. Dorsal plate ranging from 456 to 530 μ long 21

20. Proximal seta of coxa I slightly shorter than the slim distal seta. Seta j1 of dorsal plate 28 to 30 μ long. Common on *Oryzomys fulvescens* .... *Laelaps castroi* Fonseca, 1959

Proximal seta of coxa I longer than the coarse distal seta. Seta j1 of dorsal plate 18 μ long .... *Laelaps differens* Fonseca, 1936

21. Postanal seta short, 34 to 53 μ long. Dorsal plate lacking an extra seta between J3 and J4. Central setae of dorsal plate varying from very short and delicate to intermediate; j5 - 14 to 43 μ long ex *Oryzomys* species .... *Laelaps pilifer* Tipton, 1966 (including Form A)

Postanal seta 56 to 68 μ long. Dorsal plate with extra seta between setae J3 and J4. Central setae of dorsal plate strong and coarse; j5 - 67 to 75 μ long ex *Oryzomys* species and *Neacomys tenuipes* .... Form B of *Laelaps pilifer* Tipton, 1966

Laelaps acuminata Furman

(Fig. 23)

Laelaps acuminata Furman, 1972:39.

A total of 797 females, 12 males and 4 nymphs of *L. acuminata* was identified from 62 infested host specimens in Venezuela; 676 were taken from 24 *Oryzomys concolor*, 92 from 18 *O. bicolor*, 6 from 4 *O. albigularis* and 5 from 5 *O. minutus*. Recoveries of the mite were made on 1 or 2 occasions each from a variety of other rodents, a marsupial and even from bats; these are considered as accidental associations. The mite was also taken from *Oryzomys* sp. in Sonso, Dept. Valle in Colombia by H. Trapido.

In Venezuela *L. acuminata* is a widespread species occurring at elevations from 4 to 3430 m. In descending order of freqency it was taken in the following states (or district): Monagas, Dto. Federal, Bolivar, Sucre, Apure, Merida, Miranda, Carabobo, Trujillo, T. F. Amazonas, Tachira and Zulia.

The ♀ of *L. acuminata* is of medium size for the genus, with dorsal plate 586 to 664 μ long. Coxa I (Fig. 23) with proximal seta 3 to 5 times longer than wide, inflated basally and with a characteristic short, acuminate, flexible, whiplike tip; distal seta a slim setiform subequal in length to proximal seta. The characteristic proximal seta of coxa I separates it from its close relatives, *L. pilifer* Tipton, *L. thori* Fonseca and *L. ovata* Furman. It differs also from *L. pilifer* in being larger (dorsal plate only 456 to 530 μ long in *L. pilifer*) and in having relatively longer gnathosomal and inner hypostomal setae (Fig. 23). *L. thori* has a long, slim proximal seta on coxa I, 43 μ long by 5 μ wide in the holotype, and the distal seta is only ⅔ as long. *L. ovata* is smaller than *L. acuminata*, having a dorsal plate 502 to 540 μ long, very short gnathosomal setae, 13 to 18 μ long, and a rather angulate genitoventral plate. In some areas *L. acuminata* and *L. ovata* are sympatric, even occurring occasionally together on *O. albigularis*, but in such instances no intergrading of differential characters has been observed.

One female identified as *L. acuminata* from *O. concolor* has setiform proximal setae on coxae I rather than the characteristic inflated seta with acuminate tip. In all other respects it fits the original description of the species, but on casual inspection might be confused either with *L. thori* Fonseca or *L. ovata* Furman.

Laelaps (*Echinolaelaps*) *boultoni* Furman and Tipton

Laelaps (*E.*) *boultoni* Furman and Tipton, 1961:168.

A total of 73 females of *L. boultoni* from Venezuela was examined, of which 49 were from 9 *Neacomys tenuipes*, 15 from 2 *Oryzomys fulvescens*, 8 from 1 *O. concolor* and 1 from *Rhipidomys venezuelae*. Infested hosts were collected at elevations ranging from 404 to 1665 m in the Dto. Federal and the states of Miranda, Falcon, Bolivar, Aragua and Yaracuy.

Specimens examined agree well with the original description and figures of *L. boultoni*. The species is distinguished from other members of the subgenus *Echinolaelaps* by the presence of bulbous spines on coxae and femora of legs I.

Laelaps castroi Fonseca

Laelaps castroi Fonseca, 1959:116.—Furman, 1971*a*:70. [lectotype described].

A total of 477 females, 8 males and 9 nymphs of *Laelaps castroi* was examined from Venezuela; of these 452 were from 78 *Oryzomys fulvescens*. The remaining specimens represent single or occasional collections from a variety of other rodents and even bats; these are considered accidental associations. Infested hosts were collected from sea level to 1760 m elevation from localities in the following states, arranged in order of greater to lesser frequency of occurrence: Monagas, Carabobo, Miranda, Sucre and Falcon.

Venezuelan specimens of *L. castroi* agree rather closely with Fonseca's (1959) original description and with the redescription of the lectotype given by Furman (1971). They are slightly smaller, with a dorsal plate ranging from 526 to 575 μ long compared to 587 μ long in the lectotype; they lack an accessory submedian seta anterior to setae J4 of the dorsal plate, and the coxal setae of leg I show a range of length to about 1/5th greater than that seen in the lectotype. These variations are considered within the normal intraspecific range.

L. castroi is closely related to *L. flexa* Furman, *L. pilifer* Tipton and also more distantly related to *L. paulistanensis* Fonseca and *L. manguinhosi* Fonseca. Differential characters are considered in the discussion of those species.

From the lectotype of *L. differens* Fonseca, 1939, *L. castroi* differs in having setae j1 of the dorsal plate 28 to 30 μ long as opposed to 18 μ, and in having on the coxa of leg I a piliform to slender setiform distal seta, slightly longer than the proximal seta, whereas in *L. differens* the distal seta is coarse and much shorter than the proximal seta.

Laelaps (*Echinolaelaps*) *conula* Furman

Laelaps conula Furman, 1972:41.

A total of 620 females of *L. conula* was examined from 45 infested host specimens from Venezuela. The common host is *Rhipidomys macconnelli*; 39 infested specimens yielded 563 *L. conula*. Single collections were recorded from a variety of other rodents, a marsupial and a bat; these are considered accidental associations.

The majority of infested hosts was taken at an elevation around 1000 m (ranging from 150 to 1480 m). The mite was encountered only in T. F. Amazonas and the state of Bolivar.

L. conula is a typical member of the subgenus *Echinolaelaps* but easily distinguished from other species of the subgenus. It is a large, well-sclerotized species with a small, median, anterior, triangular projection on the sternal plate. Coxa 1 has a strong, gently tapered, rather sharply tipped proximal spine of modified fusiform shape. The genitoventral plate is broad and convexly rounded posteriorly. The dorsal plate has 6 to 7 extra setae on the posterocentral area.

Laelaps crinigera Furman
(Fig. 24 and 25)

Laelaps crinigera Furman, 1972:44.

This was a rarely encountered species in Venezuela, with a total of only 18 specimens encountered. Fifteen females of *L. crinigera* were examined from 5 infested *Oryzomys concolor*, 2 from 1 *O. minutus* and 1 from 1 *O. bicolor*. Infested hosts were taken at elevations of 76 to 2410 m, most from T. F. Amazonas, but also from Apure, Tachira and Bolivar states.

L. crinigera is a medium-sized species with superficial resemblance to *L. castroi*. The dorsal plate varies in length from 607 to 644 μ and has strong, relatively long setae (Fig. 24). Leg I with femur bearing a dorsoapical spiniform seta, 64 to 70 μ long, much longer and stronger than other dorsal leg setae (Fig. 24). Sternal plate is longer than, or subequal to, width (Fig. 25).

Laelaps dearmasi Furman and Tipton

Laelaps dearmasi Furman and Tipton, 1961:187.

L. dearmasi was the most commonly encountered species of the genus in Venezuela. A total of 12,889 females, 3,846 males, 2,122 nymphs and 72 larvae was examined from 674 infested hosts. By far the commonest host was *Zygodontomys brevicauda*. Unidentified species of *Zygodontomys* were the only other frequently recorded hosts. In addition to these hosts, 50 other species of vertebrates were recorded as infested with *L. dearmasi*. Most of these are regarded as purely accidental associations, but a few seem to represent more than casual relationships: 12 *Heteromys anomalus* had 62 females, 15 males and 8 nymphs; 6 *Proechimys guyannensis* had 51 females, 4 males and 5 nymphs; 8 *Sigmodon hispidus* had 10 females and 1 male.

Hosts found infested with *L. dearmasi* were taken at elevations ranging from sea level to 3200 m, but the majority were taken at elevations under 400 m. Infested hosts were collected in the following states and district, listed in order of greatest to least numbers: Trujillo, Miranda, T. F. Amazonas, Falcon, Monagas, Sucre, Yaracuy, Lara, Bolivar, Carabobo, Guarico, Dto. Federal, Apure, Merida, Zulia, Nueva Esparta.

L. dearmasi is the only South American species of the genus with very long gnathosomal setae extending well beyond the posterior margin of the gnathosoma in both sexes. Females are characterized by the convex posterior margin of the sternal plate, genital setae arising well inside lateral margins of genitoventral plate, and adanal setae arising well posterior of the rear margin of the anus. The flexible setae of the body may appear either straight or sinuous. Heating specimens freshly mounted in Berlese type medium tends to accentuate the sinuous appearance of flexible setae.

Laelaps (*Echinolaelaps*) *echidninus* Berlese

Laelaps (*Echinolaelaps*) *echidninus* Berlese, 1887:157.

A total of 32 females and 1 nymph of *L. echidninus* was collected from 4 *Rattus rattus* collected at Salamanca, Nueva Esparta, Venezuela.

L. echidninus is a cosmopolitan parasite in temperate and tropical areas, primarily parasitizing murid rodents, especially species of *Rattus*. For a discussion of the systematics and range of morphological variation seen in *L. echidninus* reference is made to the excellent paper by Strandtmann and Mitchell (1963).

Laelaps flexa Furman

Laelaps flexa Furman, 1972:35.

A total of 1357 females, 47 males and 23 deutonymphs of *Laelaps flexa* was identified from 252 infested host specimens in Venezuela. The common host was *Oryzomys minutus;* from 217 infested specimens were taken 1220 females, 44 males and 24 deutonymphs of *L. flexa*. Occasional or single collections were recorded from a wide variety of rodents, a marsupial, an edentate, and even a bird. These are regarded as accidental associations. The majority of the collections were made at elevations around 3000 m (ranging from 1032 to 3810 m). *L. flexa* was encountered most frequently in the state of Merida, but numerous collections were made in the states of Tachira and Trujillo and in the Dto. Federal, with occasional records from the states of Aragua, Miranda, Apure, Sucre and Bolivar.

The adult female of *Laelaps flexa* is medium-sized for the genus with a broadly oval idiosoma 622 to 712 μ long. Some posterior body setae are conspicuously long (140 to 160 μ), and flexible, often appearing sinuous. Coxa I has a proximal spiniform seta which is stout and triangular, about twice as long as basal width; the distal seta is slender but subequal in length to proximal seta. Gnathosomal setae are much shorter than inner hypostomal setae. Genitoventral plate broadly expanded posteriorly with relatively short genital setae just reaching bases of setae II of the plate. The male is characterized by numerous long, flexible setae on both legs and body, with the central dorsal plate setae much shorter than marginal and posterior setae.

Laelaps flexa is most closely related to *L. paulistanensis* Fonseca, but it is a smaller species with relatively longer and more flexible setae; in the female the sternal plate is more broadly concave posteriorly, and the proximal spiniform seta is not of the elongate, semi-elliptical, or fusiform shape seen in *L. paulistanen-*

sis. The male of *L. flexa* is separable from *L. paulistanensis* by the much longer and flexible setae of the dorsal plate, except for those of the anterocentral area, and the similarly long, flexible setae of legs III and IV, the holoventral plate and ventral cuticula. The ventral area of the holoventral plate is less expanded than in *L. paulistanensis*, and the anterior ventral row of setae is composed of 3 pairs of setae rather than 2 pairs. The spermadactyl of *L. flexa* is only about 67 μ long compared to 85 μ long in Venezuelan specimens of *L. paulistanensis*.

Laelaps manguinhosi manguinhosi Fonseca

Laelaps manguinhosi Fonseca, 1936*c*:34.—Furman, 1971*a*:72. [lectotype described].

Laelaps oryzomydis Pratt and Lane, 1953:358.—New syn.

A total of 1262 *Laelaps manguinhosi manguinhosi* was identified from 83 infested hosts in Venezuela. Collections of the mite were numerous from *Holochilus brasiliensis;* 506 females, 2 males (?) and 2 nymphs of *L. m. manguinhosi* were obtained from 23 hosts. *Nectomys squamipes* was also frequently infested; 30 hosts produced 521 females, 1 male and 6 nymphs. Occasional or single collections were taken from a wide variety of rodents, marsupials, bats and a bird; despite the fact that some of the rodents were heavily infested, these latter records are considered representative of accidental assocations. In common with other mites which are primarily nest inhabitants, *L. m. manguinhosi* would undoubtedly infest, at least temporarily, almost any warm-blooded animal with which it came in contact.

The majority of collections was made below 500 m elevation, but the range over which the mite was found varied from 1 to 3430 m. *L. m. manguinhosi* was collected in Venezuela in the following states, arranged in order of greatest to least frequency: Trujillo, T. F. Amazonas,

TABLE 1. Comparison of members of *Laelaps manguinhosi* complex

Character	Lectotype *L. m. manguinhosi*	Paratype *L. oryzomydis*	Venezuelan *L. m. manguinhosi*`*`	Venezuelan *L. m. calvescens*`**`
Idiosoma length	676	610	602–682	596–650
Dorsal plate length/width	590/386	583/378	590–656/ 376–430	570–600/ 376–419
Extra seta on dorsal plate	yes (1)	yes (1)	yes (1 to 2)	no
length j1	25	26	27–32	25–26
length j5	52	52	49–67	18–24
length J5	41	45	37–48	28–32
length Z5	89	>79	88–100	65–73
Distance j5 to z5	44	49	46–55	48–51
Sternal plate length/width	87/141	93/143	81–100/ 140–161	95–98/ 153–161
Genitoventral plate length/width	140/170	156 165	150–172/ 169–182	142–161/ 170–188
Anal plate length/width	93/103	–/98	85–106/ 96–114	98–104/ 104–112
Adanal setae length	44	38	39–49	34–38
Postanal seta length	–	67	67–85	51–52
Gnathosomal setae length	15	14.5	14–19.5	13–15
Inner hypostomal setae length	42	30	35–43	30–35
Coxa I proximal seta				
length	26.5	approx. 29	30–38	30–33
width	13	11	12–14.5	12–14
Coxa I distal seta				
length	27.5	29	26–30	19–22
width	6.5	5	6–7	6–7

---

*Range based on 15 specimens from *Holochilus brasiliensis* and *Nectomys squamipes*.

**Range based on 4 specimens from *Daptomys venezuelae*

Monagas, Carabobo, Zulia, Bolivar, Apure, Merida, Miranda and Yaracuy.

Laelaps m. manguinhosi has a geographic range extending from Brazil to the United States. *Laelaps oryzomydis* Pratt and Lane, 1953, described from the southeastern United States ex *Oryzomys palustris*, is considered a synonym of *L. m. manguinhosi*. Examination of a paratype of *L. oryzomydis* indicated that it falls almost completely within the range of variation seen in specimens collected in Venezuela, as well as fitting closely the characters of the lectotype of *L. m. manguinhosi* (see Table 1). Two additional specimens from *O. palustris* in North Carolina and Texas, fall completely within the range of characters seen in Venezuelan specimens. Particularly variable is the length-width relationship of the proximal spine of coxa I, which varies from 2 to 3 times longer than wide.

From the closely related *L. castroi*, *L. m. manguinhosi* is distinguished by a coarse, often spiniform distal seta of coxa I as opposed to a slim setiform in *L. castroi*, and by the short gnathosomal setae, 14 to 19.5 μ long, as opposed to 24.5 to 30 μ in *L. castroi*.

Laelaps manguinhosi calvescens, new subspecies

(Fig. 28-30)

DIAGNOSIS

A medium-sized mite differing from the nominotypic subspecies in having very small setae in the central area of the dorsal plate, short genital setae, and the proximal seta of coxa I about 1⅓ times as long as the distal seta (Table 1).

The description of the female of *Laelaps manguinhosi calvescens* is based on the holotype, followed in parentheses by the range of variation in 3 paratypes.

DESCRIPTION

FEMALE: Idiosoma broadly oval, 596 μ long (640 to 650). Dorsal plate (Fig. 28) covering all but narrow lateral and posterior margins of idiosoma, 570 μ long (590 to 600) and 376 μ wide (398 to 419); bearing 39 pairs of setae in the usual pattern, but with the following setae much reduced and delicate: j4 to 6, J1 to 5, z5 and 6, px2 and 3; setal lengths: j1 - 25 μ (26), j5 - 24 μ (18-24), J5 - 30 μ (28-32); distance between trichopores of setae j5 and z5 - 49 μ (48-51). Dorsolateral idiosomal margin with single row of setae about 43 μ long, subequal to adjacent marginal setae of dorsal plate, but becoming longer, up to 70 μ, posteriorly. *Venter.* Sternal plate 98 μ long on midline (95-98) and 161 μ wide (153-161) at level of setae II; anterior margin almost straight; posterior margin gently concave; setae very slim, acuminate; setae I about 60 μ long (61-67), reaching level of second pair of pores, and with trichopores separated by 72 μ (68-72); setae III 85 μ long (84-85), and with trichopores separated by 150 μ (150-161). Genitoventral plate expanded behind coxae IV; length 142 μ (156-161) measured from anterior level of genital setae trichopores to posterior margin of plate; maximum posterior width 170 μ (177-188); genital setae 76 μ long (74-79) reaching approximate level of setae II trichopores; setae IV more closely spaced than genital setae. Anal plate broader than long, of inverted pyriform shape, 98 μ long (98-104) and 104 μ wide (110-112); adanal setae 38 μ long (34-38); postanal seta stronger and longer, 51 μ (51-52). Metapodal platelets roughly rod shaped, about 35 μ x 10 μ. Tubular peritreme extending to anterior level of coxae II. Unarmed opisthogaster with 5 to 6 pairs of setae. *Gnathosoma.* Chelicerae normal, with pilus dentilis slightly inflated basally, gently curved and setiform apically. Gnathosomal setae 15 μ long (12-15), and inner hypostomal setae 30 μ long (32-35). Deutosternal groove with 6 rows of denticles. *Legs.* Coxa I (Fig. 30) with proximal seta a stoutly triangular spiniform 33 μ long (30-33) and 12 μ wide (13-14) at base; distal seta a slim spiniform 19 μ long (19-22) and 6 μ wide at base (6-7); posterior seta of coxa III rather spiniform. Leg I with a prominent, long, dorsoapical seta about 43 μ long on the femur and a longer proximodorsal seta on the genu, about 52 μ long (Fig. 29). Chaetotaxy of legs I to IV respectively: trochanter - 6, 5, 5, 5; femur - 13, 11, 6, 6; genu - 13, 11, 9, 10; tibia - 13, 10, 8, 10.

TYPE DATA: Female holotype and 13 paratypes were collected from *Daptomys venezuelae* (SVP 16634), Cerro Duida Cabecera del Caño Negro, T. F. Amazonas, Venezuela, 1400 m elev., 15-II-67 by the M. D. Tuttle team. The male and immature stages are unknown.

Laelaps mazzai Fonseca

(Fig. 31)

Laelaps mazzai Fonseca, 1939*b*:112 and 135.

Schizolaelaps mazzai, Fonseca, 1959:139. [male redescribed and illustrated].

Schistolaelaps mazzai, Fonseca, 1960*a*:114.—Furman, 1971*a*:73. [synonymized].

A total of 14 females and 2 males of *Laelaps mazzai* was examined from Venezuela. With the

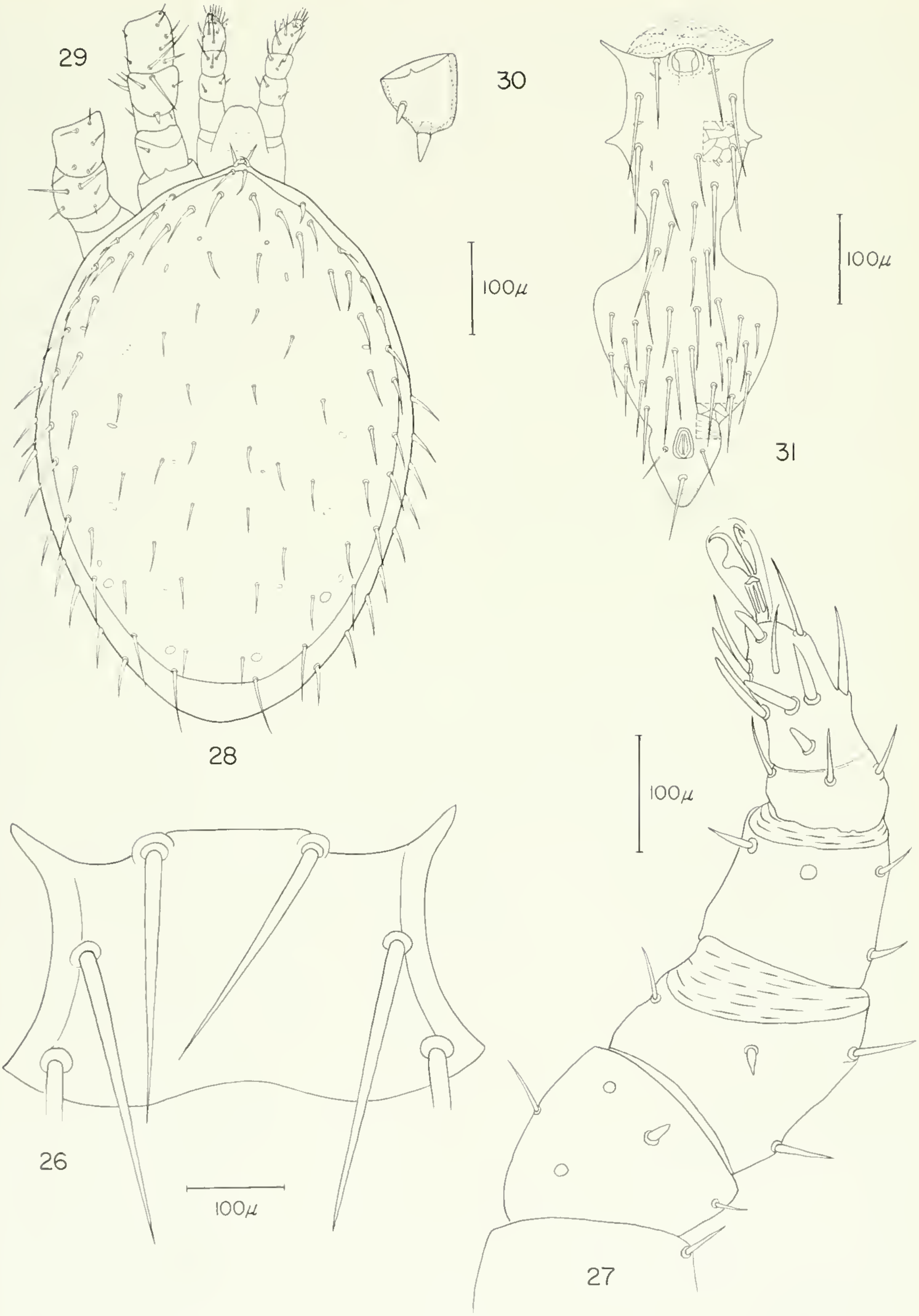


Fig. 26-31. 26-27, *Gigantolaelaps versteegi* (Oudemans): 26, sternal plate of female from Oudemans' original type material; 27, ventral view of leg II of type male. 28-30, *Laelaps manguinhosi calvescens*, new subspecies: 28, dorsal view of idiosoma of female; 29, dorsal view of femur and genu I of female; 30, ventral view of coxa I of female. 31, *Laelaps mazzai* Fonseca: holoventral plate of male from *Calomys hummelincki*, Venezuela.

exception of 1 male from *Sigmodon hispidus*, all specimens were taken from 8 *Calomys hummelincki*. Infested hosts were collected at elevations ranging from 15 to 76 m. Five collections were made in the state of Monagas, 3 in Apure and 1 in Zulia.

Female specimens of *Laelaps mazzai* from Venezuela agree fairly closely with the lectotype as redefined by Furman (1971*a*). Comparative characters are given in Table 2. The Venezuelan forms vary in being slightly larger, with correspondingly larger dorsal, sternal, genitoventral and anal plates. An additional 2 females of *L. mazzai* from Bolivia loaned for study through the courtesy of Dr. R. W. Strandtmann proved to be somewhat intermediate in characteristics betwen the lectotype and the Venezuelan specimens.

The 2 male specimens of *L. mazzai* differ rather markedly from the allotype as described by Fonseca. The anal plate is not separate from the ventral portion of the holoventral plate (Fig. 31), although marginal indentations of the holoventral plate are present just cephalad of the areas corresponding to the anterior shoulders of the anal plate of the female. Examination of the allotype indicated a very indistinct separation of anal and ventral portions of the holoventral plate, with more irregular margins than illustrated by Fonseca. I interpret this as indicative of an unstable character which may be evidenced by either a complete or incomplete holoventral plate in different populations of the same species. The number of setae of the male dorsal plate is only 152 to 188 in the 2 Venezuelan specimens, considerably fewer than seen in the allotype. The spermadactyl of the Venezuelan specimens is about 147 μ long, longer than the combined 2 basal segments of the chelicera; the structure was not visible on the allotype, but Fonseca (1959) reported the spermadactyl as only about 80 μ long in a specimen examined from *Proechimys iheringi denigratus* in northeastern Brazil.

The similarities between the type material of *L. mazzai* and the Venezuelan specimens are such that I consider them representative of a single species, attributing the differences to intraspecific variation. This stand is strengthened by the fact that the common host of the Venezuelan specimens is *Calomys hummelincki*. Fonseca (1959) reported *Hesperomys* (= *Calomys*) to be an extremely common host of *L. mazzai* in northeastern Brazil.

TABLE 2. *Laelaps mazzai* females

Character	Lectotype *L. mazzai*	Venezuelan *L. mazzai**
Idiosoma length	684	805–865
Dorsal plate length/width	592/458	697–752/440–510
± dorsal plate setae	approx. 64 pairs	60–64 pairs
length j1	32	32–43
length j2	approx. 65	approx. 65
length J5	39	45-52
length Z5	–	107–121
Sternal plate length/width	90/175	123–134/172–180
Genitoventral plate length/width	132/166	145–166/171–177
Anal plate length/width	90/94	98–115/103–110
Adanal setae length	–	50–56
Postanal seta length	–	80–96
Gnathosomal setae length	27	33–40
Inner hypostomal setae length	32	36–43
Femur I apicodorsal seta length	72	65–85
Genu I proximodorsal seta length	108	97–110
Coxa 1 proximal seta length/width	48/8	40–43 8.5
Coxa 1 distal seta length/width	32/6	33–38/6

*Range based on 5 specimens from *Calomys hummelincki*

Laelaps nuttalli Hirst

Laelaps nuttalli Hirst, 915:183.

Laelaps hawaiiensis Ewing, 1924:118.

Haemolaelaps nuttalli Turk, 1950:67.

A single collection of 3 female *L. nuttalli* was taken from *Rattus rattus* at Boca de Yaracuy, 35 km NW Puerto Cabello, Yaracuy, Venezuela on 8-X-65.

Laelaps nuttalli is a medium-sized *Laelaps* with the proximal seta of coxa 1 an elongate setiform, longer and slimmer than the distal spiniform seta. The genital setae are more closely spaced, or subequal in spacing to genitoventral setae IV; genitoventral setae II and III are more widely spaced, with setae III slightly the most widely spaced.

Laelaps ovata Furman

Laelaps ovata Furman, 1972:41.

A total of 603 females of *Laelaps ovata* was examined from 119 infested hosts. The common host was *Oryzomys albigularis*; 484 females were taken from 87 of these hosts. The following hosts were found infested occasionally or once: *O. minutus*, *O. fulvescens*, *Rhipidomys venustus*, *Akodon urichi*, *Zygodontomys brevicauda*, *Thomasomys lugens*, *Calomys hummelincki*, *Neacomys tenuipes*, *Sigmodon hispidus*, *Rattus rattus*, *Heteromys anomalus*, *Marmosa fuscata*, *Monodelphis brevicaudata* and *Bradypus infuscatus*.

Infested hosts were taken at elevations ranging from 25 to 3200 m, but most collections were taken at elevations of 1200 to 2200 m. The states (or district) in which they were taken are listed in order of greatest to least frequency of infested hosts encountered: Dto. Federal, Merida, Trujillo, Tachira, Aragua, Miranda, Guarico, Yaracuy, Carabobo and Apure.

Laelaps ovata appears very similar to the species from Panama referred by Tipton et al. (1966) to *Laelaps thori* Fonseca, 1939. The common host of the Panamanian as well as the Venezuelan mites was *O. albigularis*. It is possible that the Venezuelan and Panamanian specimens represent only variants of *L. thori*, but examination of the holotype of Fonseca's species indicates otherwise. The type of *L. thori* is a larger mite, with the dorsal plate 678 μ long compared to 502 to 540 in *L. ovata*; the proximal seta of coxa I is a very slender setiform over 8 times longer than wide (43 μ x 5 μ), compared to a strong setiform 3.5 to 6 times longer than wide in *L. ovata* (26 to 30 μ x 5 to 7 μ); the gnathosomal setae are 32 μ long compared to only 13 to 18 in *L. ovata*. These and other differential features distinguishing the species are primarily representative of differences in size, but they represent not only discontinuous series but disproportionate size relationships.

Laelaps paulistanensis Fonseca

Laelaps paulistanensis Fonseca, 1936*c*:33.—Fonseca, 1959:132 [male described and illustrated].

Laelaps hirsti Fonseca, 1939*b*:117 and 139.—Fonseca, 1959:119 [syn].

A total of 1078 females, 30 males and 19 nymphs of *Laelaps paulistanensis* was identified from 140 infested hosts collected in Venezuela: 514 females, 16 males and 15 nymphs from 54 *Rhipidomys venustus*; 186 females and 10 males from 17 *R. venezuelae*; 128 females, 2 males and 4 nymphs from *R. couesi*; 11 females from 4 *R. caucensis*; 3 females from 3 *R. macconnelli;* 45 females, and 1 male from *Rhipidomys* sp.; 93 females from 31 *Oryzomys fulvescens*; 44 females from 1 *O. capito;* 11 females from 2 *Oryzomys* sp.; 1 to a few specimens each from *O. minutus*, *O. concolor*, *O. albigularis*, *Neacomys tenuipes*, *Thomasomys lugens*, *T. laniger*, *Akodon urichi*, *Sigmomys alstoni*, *Sigmodon hispidus*, "bird", *Glossophaga longirostris*, *G. soricina*.

Infested hosts were taken at elevations ranging from 1 to 3160 m. The most frequently infested host, *R. venustus*, was taken at higher elevations (from 1281 to 3160 m), most commonly in the state of Trujillo, followed by Monagas, Dto. Federal and Merida. The second most commonly infested host, *O. fulvescens*, was taken at lower elevations, (from 18 to 1260 m) in the states of Falcon, Monagas, Bolivar, Guarico and Zulia. Other states from which collections of *L. paulistanensis* were made are Tachira, Sucre, T. F. Amazonas, Miranda, Nueva Esparta, Lara and Barinas.

Specimens of *L. paulistanensis* collected in Venezuela range considerably in size beyond that given by Fonseca (1936*c*) and subsequently by Furman (1971*a*). The idiosoma of the female varies from 831 to 1080 μ long, and the dorsal plate varies from 750 to 981 μ long. In Fonseca's cotypes examined, seta j5 of the dorsal plate is 84 μ long, extending well past the base of seta z5, in contrast to his illustration. Series from Venezuela show that this is a variable characteristic in *L. paulistanensis*; specimens taken from 1 *O. fulvescens* have seta j5 varying from 46 to 85 μ long. Similarly the cotypes have coxa I with a stout, gradually tapered, blunt, proximal spine appreciably shorter than the piliform distal seta. In Venezuelan specimens the proximal spine retains its characteristic appearance, but varies from being appreciably shorter than the distal seta to subequal in length.

The males of Venezuelan *L. paulistanensis* agree with Fonseca's (1959) description except that setae Z5 of the dorsal plate are present and on the plate margin, in contrast to Fonseca's description, and there are about 6 extra submedian setae in the dorsal plate area between setae J1 and J5; setae j2 and j3 are longer than illustrated by Fonseca, in contrast to the shorter j4 to j6 pairs. The spermadactyl is about 85 μ long, with a rather straight trunk and curved, tubular apex.

The closest relative of *L. paulistanensis* is *L. flexa*. Differential characters are considered in the discussion of the latter species and in the key to species of *Laelaps*.

Laelaps pilifer Tipton

(Fig. 32-37)

Laelaps pilifer Tipton, 1966:36 [Tipton, Altman, and Keenan].

A total of 295 *Laelaps pilifer* was examined from 48 infested hosts in Venezuela. The host-parasite associations are as follows: 64 females, 7 males and 1 nymph from 11 *Neacomys tenuipes;* 26 females from 7 *Oryzomys albigularis;* 22 females and 2 males from 5 *O. concolor;* 83 females and 1 male from 8 *O. capito;* 7 females from 1 *O. macconnelli*; 29 females from 3 *O. fulvescens*; 10 females from 3 O. *minutus;* 5 females from 1 *Oryzomys* sp.; 3 females, 4 males and 1 nymph from 2 *Akodon urichi;* 21 females from 1 *Rhipidomys venezuelae*; 2 females from 2 *Zygodontomys brevicauda;* 1 female from 1 *Nectomys alfari*; 4 females from 1 *Rattus rattus*; and 2 females from unknown hosts.

Laelaps pilifer was taken from infested hosts at elevations ranging from 80 to 3270 m in the following states (or district), listed in order of greatest to least frequency of collection: Dto. Federal, Bolivar, Yaracuy, Zulia, Falcon, Merida, Monagas, Miranda, Aragua, Sucre, Trujillo.

A great range of morphological variation was seen in Venezuelan *L. pilifer*, varying from forms agreeing well with the original figures and description given by Tipton (1966) to forms with dorsal plate setae either minute in size or very long and coarse. Comparative data for the 3 major forms encountered are given in Table 3.

Specimens considered representative of typical *L. pilifer* were taken most frequently from *O. capito* and less commonly from *O. concolor*. Using setae j5 of the dorsal plate as a repre-

TABLE 3. *Laelaps pilifer* females from Venezuela

Character	Form "A"*	"Normal"**	Form "B"***
Idiosoma length	478–554	494–564	505–570
Dorsal plate length width	472–516/ 278–301	456–530/ 268–322	486–524 257–307
Extra seta on dorsal plate	no	no	yes
length j1	18–24	18–22	21–25
length j5	14.5–18	24–41	65–75
length J5	16–22	22–25	31–38
length Z5	45–66	61–69	67–82
Sternal plate length width	90–96/ 111–123	76–94/ 107–118	88–107 115–126
Genitoventral plate length/width	118–124/ 128–140	114–134/ 131–136	98–113/ 125–137
Adanal setae length	25–30	24–31	28–32
Postanal seta length	34–39	34–53	56–68
Gnathosomal setae length	15	14–21	18–24
Inner hypostomal setae length	30	24–30	27–38
Coxa I proximal seta length/width	22–25 11–14	19–24/ 8–13	21–25/ 9–12
Coxa I distal seta length	16–18	16–22	18–23

*Range of 5 specimens ex *Oryzomys concolor* and *Akodon urichi*
**Range of 9 specimens ex *Oryzomys capito* and *O. concolor*
***Range of 20 specimens ex *Oryzomys albigularis*, *O. minutus*, *O. concolor*, *Oryzomys* species and *Neacomys tenuipes*

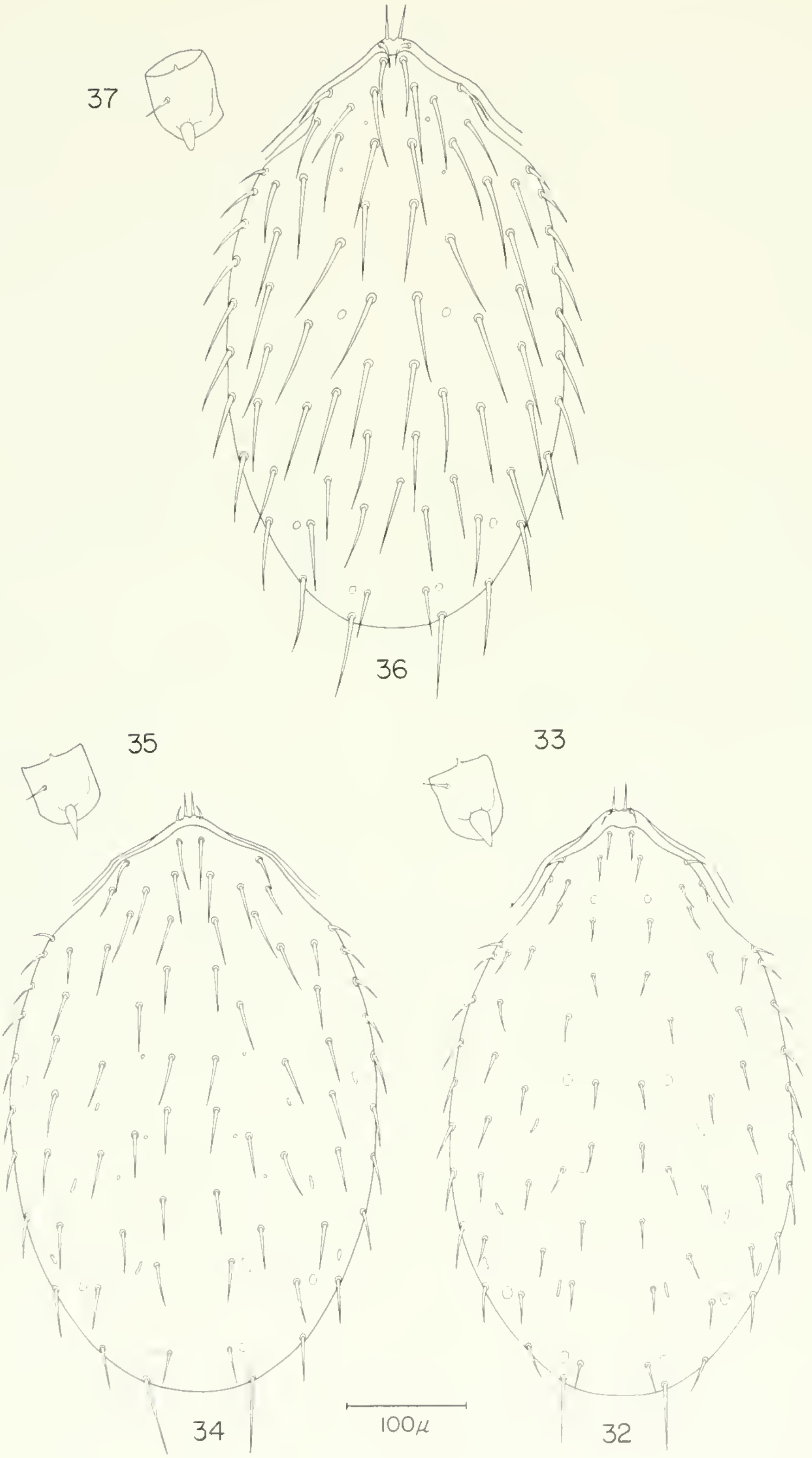


Fig. 32-37. *Laelaps pilifer* Tipton, dorsal plate and coxa I: 32-33, Form A from *Oryzomys concolor;* 34-35, normal form from *Oryzomys capito;* 36-37, form B from *Neacomys tenuipes.*

sentative index of setal length in the central area of the plate, the length varies from 32 to 43 μ in typical specimens (Fig. 34); in these forms the proximal seta of coxa I usually has the short, triangular, spiniform appearance typical of the species (Fig. 35), although occasional series are encountered in which the proximal seta has a short piliform tip.

Specimens considered as form A of *L. pilifer* were taken from *O. concolor* and *A. urichi*. In form A the central setae of the dorsal plate are very short and delicate; setae j5 range from 14 to 18 μ long (Fig. 32). In other respects form A agrees well with typical *L. pilifer*.

Specimens considered as form B of *L. pilifer* were taken from the following hosts, arranged in order of greatest to least frequency: *N. tenuipes*, *O. albigularis*, *O. minutus*, *O. fulvescens*, *Z. brevicauda*, *A. urichi*. In form B the central setae of the dorsal plate are elongate (Fig. 36); setae j5 are coarse and 67 to 75 μ long. In this form the proximal seta of coxa I is spiniform but much blunter than in either typical or form A specimens (Fig. 37).

It is primarily because of the apparent instability of characteristics in specimens of this complex which usually have been considered stable at the specific level that I have not established separate taxa for forms A and B. No two of the forms have been found in common on an individual host, although some occur on the same species of host in different geographical areas.

Laelaps pilifer is closely related to *L. castroi* from which it differs in its smaller size and in having the apicodorsal seta ADI of femur I stouter and longer than the proximodorsal seta PD3 of genu I, rather than having ADI of femur I smaller than, or subequal to, PD3 of genu I as in *L. castroi*; in *L. pilifer* the adanal setae arise well anterior to the caudal margin of the anus, while in *L. castroi* the adanal setae arise at the level of the caudal margin of the anus. Of the 3 forms of *L. pilifer* considered here, form B resembles most closely *L. castroi*, particularly in length of dorsal plate setae.

Laelaps spicata Furman

Laelaps spicata Furman, 1972:45.

Laelaps spicata is represented by 11 female specimens taken in Venezuela: 6 specimens from 3 *Oryzomys concolor*, 1 from *O. minutus*, 1 from *O. macconnelli* and 3 from 1 *Rhipidomys* sp. Collections were made at elevations of 135 to 2410 m in the states of Bolivar, Tachira and T. F. Amazonas.

Laelaps spicata is a small species for the genus with an ovate body and a dorsal plate 538 to 580 μ long by 322 to 360 μ wide, which covers most of the idiosoma. It is characterized by a prominent, spikelike proximal spine borne on a tubercle of coxa I, and a short, delicate piliform distal seta. Setae of dorsal and ventral plates very delicate and short; posterior terminal (Z5) and subterminal (J5) setal pairs of dorsal plate short and subequal. Postanal seta subequal to adanal setae or only slightly larger. Dorsal and ventral plates strongly reticulated.

Laelaps spicata shares several characters with *L. pilifer*, with which it was occasionally collected. It differs in many features, however, including the larger proximal spine of coxa I borne on a tubercle, scalelike markings of coxa I, smaller and more delicate body setae, lack of enlargement of dorsal plate setae Z5, or of the postanal seta, longer sternal plate and much stronger reticulation of both dorsal and ventral plates.

Laelaps surcomata Furman

Laelaps surcomata Furman, 1972:42.

Laelaps surcomata is represented by only 20 female specimens taken during the Venezuelan faunal survey from 8 *Rhipidomys macconnelli*. Infested hosts were taken at elevations between 750 and 1400 m during May and June 1966, 85 km SSE El Dorado, Bolivar state, Venezuela.

Laelaps surcomata is a rather large species for the genus, broadly ovate and with the dorsal plate 720 to 760 μ long by 400 to 458 μ wide, with moderate hypertrichy, 98 to 100 setae on dorsal plate, and with all coxal setae setiform. The proximal seta of coxa I is about 8 times longer than wide and over 1½ times longer than the distal seta. Leg I has very little enlargement of the dorsal setae of the femur and genu.

In size and general facies *L. surcomata* has a superficial resemblance to *L. paulistanensis*, with which it was occasionally found on *R. macconnelli*. It differs in many features, however, including size and shape of coxal setae, lack of enlargement of dorsal setae of femur and genu I, and hypertrichy of the dorsal plate.

Genus *Tur* Baker and Wharton

Protonyssus Turk, 1946:347.

Tur Baker and Wharton, 1952:85 (for *Protonyssus* Turk, not *Protonyssus* Trouessart, 1915).—Furman and Tipton, 1958:541 [redescription of genus].

Type Species: *Protonyssus uniscuttatus* Turk.

Tur is composed of mites very closely related to *Laelaps*. Serious doubts have been raised as to its validity by Tipton et al. (1966), Strandtmann and Mitchell (1963) and Furman and Tipton (1961).

Study of specimens of 8 of the 9 species previously allocated to *Tur*, plus 3 new species described herein, provides the basis for retention of *Tur* as a valid genus, with some modification of the diagnostic criteria provided most recently by Garrett and Strandtmann (1967).

Tur is composed of small to large laelapines, with females ranging from 560 to 1350 microns in body length. Anal and genitoventral plates usually fused or in juxtaposition, the 2 regions bearing 3 and 8 setae respectively. Dorsal plate with 39 pairs of setae (1 species with an extra posteromedial seta). Broad extension of peritremalia posterior to stigmata. Female chelicerae partially or completely enveloped in a membrane, and the pseudosetae (arthrodial processes) at the base of the movable digit usually very long. Gnathosomal setae usually spiniform. Genu of leg IV with 9 setae. Chaetotaxy robust.

A distinctive feature separating *Tur* from *Laelaps* and close relatives is the chaetotaxy of the legs of the females, which agrees completely with the holotrichous condition described for most free-living adult dermanyssoid mites by Evans and Till (1965). In *Laelaps* the leg chaetotaxy differs from the holotrichous condition in having 10 to 11 rather than 9 setae on the genu of leg IV.

Primary hosts of *Tur* species are hystrichomorph rodents of the family Echimyidae.

The diagnosis accepted here for *Tur* necessitates the transfer to the genus *Laelaps* of *Tur anomalus* Tipton 1966, and *Tur breviperitremus* Garrett and Strandtmann 1967. Both species have 10 setae on the genu of leg IV. Tipton's species also has small gnathosomal and hypostomal setae as typical of *Laelaps*. The details of the cheliceral structure are in doubt. Features which led Tipton to place his species in *Tur* included the juxtaposition of the genitoventral and anal plates and the existence of broad peritremalia. These characteristics are found in some species of both *Tur* and *Laelaps* and do not by themselves constitute diagnostic criteria. *L. breviperitremus* has chelicerae characteristic of *Laelaps* in lacking the enveloping membrane seen in *Tur*, and in having short arthrodial processes at the base of the movable digit.

Key to Species of *Tur*
Females

1. Anal plate fused with genitoventral plate 2
Anal plate separate from genitoventral plate 5

2. Sternal setae extending well past posterior margin of sternal plate. Setae of coxae I long, uninflated. Large species, over 1000 μ body length 3
Sternal setae not as above. Setae of coxae I swollen and shorter than width of coxa. Smaller, body length less than 900 μ 4

3. Genu of leg I with posterodorsal seta 2 no longer than the segment and subequal to anterodorsal seta 1 and posterodorsal seta 1 of femur 1. Dorsal plate lacking an extra seta between setae J4 ..... *Tur amazonicus* Fonseca, 1960
Genu of leg I with posterodorsal seta 2-1½ times as long as the segment and much longer than anterodorsal seta 1 and posterodorsal seta 1 of femur I. Dorsal plate with an extra, strong seta between setae J4 ..... Form 2 of *Tur amazonicus*

4. Setae of coxa I and gnathosomal setae bulbous proximally, terminating in a fine apical filament. Trochanters III and IV each with an asymmetrically enlarged seta ..... *Tur apicalis* Furman and Tipton, 1961
Setae of coxa I and gnathosomal setae conically spiniform. Trochanters III and IV with all setae normal ..... *Tur uniscutatus* (Turk, 1946)

5. Gnathosomal setae, setae of coxa I, posterior setae of coxae II and III and setae AD1 of femora I and II modified into strong, blunt, striated, clublike processes ..... *Tur clavator*, new species
Setae not as above 6

6. Gnathosomal setae bulbous or inflated proximally, terminating in a fine acuminate tip. Coxa I with 1 or both setae inflated basally and with fine acuminate tip 7
Gnathosomal setae and setae of coxa I not as above 8

7. Gnathosomal setae and both setae of coxa I bulbous proximally and terminating in a fine acuminate tip .... Form 2 of *Tur apicalis*

   Gnathosomal setae and distal seta of coxa I inflated proximally and terminating in a fine acuminate tip. Proximal seta of coxa I a long, slim setiform .... *Tur subapicalis,* new species

8. Gnathosomal setae short, heavy, spiniform. Genitoventral setae not forming 2 straight diverging lines; fourth setal pair closer together than the third .... *Tur aragaoi* (Fonseca, 1939)

   Gnathosomal setae either strong or delicate, but not short, heavy, spiniform. Genitoventral setae forming 2 relatively straight diverging lines; fourth setal pair farther apart than the third 9

9. Posterior margin of genitoventral plate clearly concave, conforming to the convex anal plate 10

   Posterior margin of genitoventral plate essentially straight or convex 11

10. Sternal setae I not reaching posterior margin of sternal plate. Adanal setae reaching base of postanal seta. Setae J5 (subterminal setae of dorsal plate) minute .... *Tur aymara* Fonseca, 1960

    Sternal setae I extending well past posterior margin of plate. Adanal setae not reaching base of postanal seta. Setae J5 more than ⅓ as long as setae Z5 .... *Tur turki* Fonseca, 1959

11. Genitoventral plate extending well posterior to insertion of setae IV, with posterior margin straight medially and in juxtaposition to anal plate. Setae J5 of dorsal plate minute, about 1/5 as long as setae Z5. Common on *Mesomys hispidus* .... *Tur expansus,* new species

    Genitoventral plate extending only slightly posterior to insertion of setae IV, with essentially straight posterior margin somewhat removed from anal plate. Setae J5 of dorsal plate over 70 μ long, about ½ or more as long as setae Z5 .... *Tur lativentralis* (Fonseca, 1935)

Tur amazonicus Fonseca

(Fig. 38 and 39)

Tur amazonicus Fonseca, 1960*a*:117.

Tur striatus Furman and Tipton, 1961:200.—Furman, 1971*a*:77 [synonymized].

A total of 237 females, 8 males and 4 nymphs of *T. amazonicus* was identified from 85 infested hosts collected in Venezuela: 162 females, 5 males and 3 nymphs from 54 *Proechimys guyannensis*, 45 females, 2 males and 1 nymph from 11 *P. semispinosus;* 25 females and 1 male from 15 *Proechimys* sp.; 1 female from 1 *Zygodontomys brevicauda*, 2 females from *Zygodontomys* sp. and 2 females from 1 *Marmosa murina*.

Typical specimens of *T. amazonicus* were taken on infested hosts at elevations ranging from 114 to 851 m, most commonly around 130 m. Most of the collections were made in T. F. Amazonas; a few were from the state of Bolivar. Two collections of 14 female specimens of an atypical population designated as Form 2 of *T. amazonicus* were taken from *P. hoplomyoides* and *P. guyannensis* 85 km SE El Dorado, Bolivar state, at an elevation of 1032 m.

Form 2 of *T. amazonicus* differs from typical populations in having an extra unpaired seta on the dorsal plate between setae J4 (Fig. 38) and in having on the genu of leg I a very long proximodorsal seta (PD2) which is 1½ times the length of the segment (Fig. 38). In typical *T. amazonicus* this seta is subequal to—or shorter than—the genu. Form 2 also differs from typical populations in having more spiniform setae on the idiosoma.

DESCRIPTION

The following description is given of the previously undescribed males of *T. amazonicus* which were associated with typical females.

MALE: Idiosoma 912 μ long and 602 μ wide. *Dorsum.* Dorsal plate covering essentially entire idiosoma, 896 μ long, 600 μ wide, with 39 pairs of long, slim, flexible setae; representative setal lengths; j1 - 65 μ and barbed, j5 - 135 μ, J5 - 135 μ, Z5 - 295 μ; distance between trichopores of setae j5 and z5 - 62 μ; plate reticulated as in female. *Venter.* (Fig. 39). Holoventral plate entire, reticulated, abruptly expanded behind coxae IV, bordering posterior

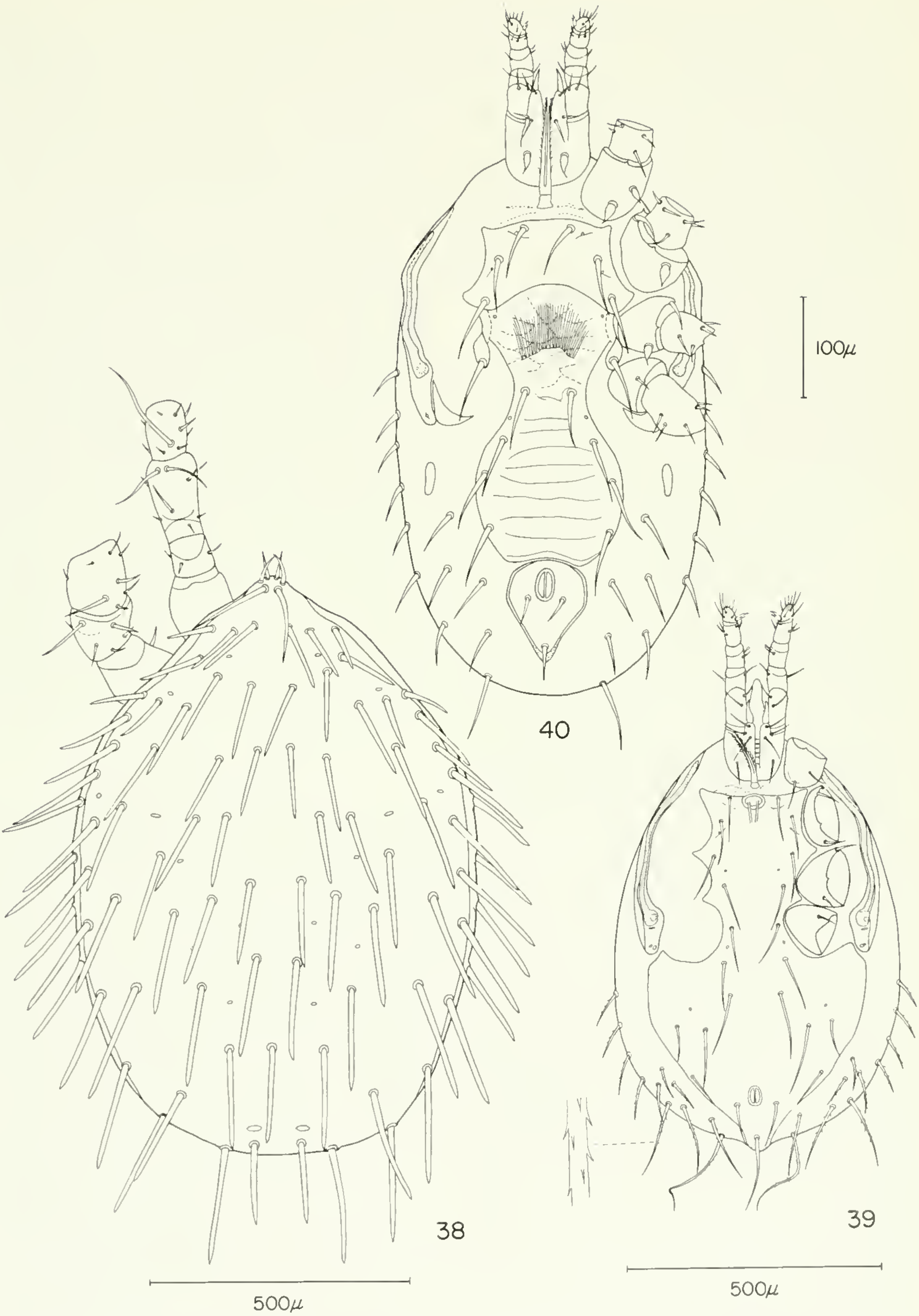


Fig. 38-40. 38-39, *Tur amazonicus* Fonseca: 38, dorsal view of form II female from *Proechimys guyannensis,* Bolivar state; 39, ventral view of male from typical population on *P. guyannensis,* T. F. Amazonas. 40. *Tur apicalis* Furman and Tipton, form II: ventral view of female from *Mesomys hispidus,* T. F. Amazonas.

margins of coxae and with anterior ventral width exceeding outer margins of coxae IV, posteriorly decreasing in width, as in the female; 750 μ long and 510 μ greatest width. Sternal setae I 104 μ long, extending ⅔ distance between setae II and III: Holoventral plate with 10 pairs of setae plus adanal pair and postanal seta; the latter 3 setae of similar form and arrangement to that of female. About 10 pairs of lightly barbed setae on unarmed opisthogaster varying from 63 to 270 μ long. *Gnathosoma.* Spermadactyl elongate, tubular, longer than combined length of basal segments of chelicera, apically coiled in 1½ revolutions; fixed digit a short, triangular membranous lobe with small pilus dentilis near its base; movable digit elongate, delicate, membranous, bifurcate near tip. Gnathosomal setae slim, setiform, 50 μ long, extending to bases of inner hypostomal setae; latter about 60 μ long. Deutosternal groove with 5 rows of 3 to 4 denticles each. *Legs.* Legs I and IV of subequal length, 870 to 890 μ to tip of caruncle; legs II and III shorter, about 760 μ long; legs II stoutest. All coxal setae slim, setiform. Many leg setae delicately barbed. Leg chaetotaxy normal as in females.

The description of the male of *T. amazonicus* is based on 7 specimens from 4 *Proechimys guyannensis*, 1 *P. semispinosus* and 1 *Proechimys* sp. taken in T. F. Amazonas, Venezuela on the Río Manapiare, San Juan, at Tamatama, Río Orinoco and Casiquiare Canal, Capibara. Representative specimens will be deposited in the collections indicated elsewhere in this paper as repositories of type series.

Tur apicalis Furman and Tipton

(Fig. 40)

Tur apicalis Furman and Tipton, 1961:197.

A total of 1277 females, 449 males and 57 nymphs of *T. apicalis* was identified from 146 infested hosts in Venezuela; 1149 females, 396 males and 50 nymphs from 93 *Proechimys guyannensis*, the most common host; 79 females, 32 males and 2 nymphs from 23 unidentified *Proechimys* sp.; 8 females and 3 males from 5 *P. semispinosus;* 3 females and 1 male from 4 *Zygodontomys brevicauda;* 1 female from *Didelphis marsupialis;* 1 female from *Sciurus igniventris*; 2 females and 1 male from 2 *Philander opossum*; 1 female from *Marmosa cinera*; 1 male from *Mesomys* sp. Several collections from hosts other than *Proechimys* probably represent accidental associations.

Infested hosts were taken at elevations ranging from 43 to 851 m, but most were found at elevations less than 150 m. Most (114) of the infested hosts were taken in T. F. Amazonas; lesser numbers (26) were taken in the state of Bolivar, particularly in the southern section of the state.

Specimens of *T. apicalis* referred to above fit the original description and figures very well with the exception that setae J5 of the dorsal plate average about 31 μ long rather than 16 μ as originally described.

In addition to the typical population of *T. apicalis*, 1 specimen designated as Form 2 of *T. apicalis* was taken from *Mesomys hispidus*, 138 m elev., Río Mavaca, T. F. Amazonas. This may well represent a new species, but since only a single female specimen was taken, it is considered here as an aberrant form of *T. apicalis* occurring on an abnormal host.

Form 2 (Fig. 40) differs from typical *T. apicalis* in smaller size (idiosoma 564 μ long by 290 μ wide; dorsal plate 500 μ long by 279 μ wide) with correspondingly smaller ventral sclerotized plates, by having the anal plate separate from the genitoventral plate, and by the presence of normal setae on trochanters of legs III and IV only. Form 2 of *T. apicalis* is also closely related to *T. subapicalis* from which it differs in smaller size and in having both proximal and distal setae of coxa I bulbous with fine acuminate tip.

Tur aragaoi (Fonseca)

(Fig. 41-43)

Laelaps aragonensis Fonseca, 1939*b*:108.—Fonseca, 1958, in litt [emended to *Laelaps aragaoi*].

Tur aragaoi, Furman and Tipton, 1958:544.

A total of 159 females and 23 males of *T. aragaoi* was identified from 62 infested hosts collected in Venezuela: 109 females and 13 males from 34 *Proechimys guyannensis;* 10 females and 4 males from 8 *P. semispinosus;* 32 females and 6 males from 13 *Proechimys* species; 1 to 2 females each from single specimens of *Calomys hummelincki*, *Echimys armatus*, *Mesomys hispidus*, *Didelphis marsupialis*, *Artibeus jamaicensis*, *A. pumilis* and *Diclidurus scutatus.*

Infested hosts were taken at elevations ranging from 130 to 851 m, but most were found at elevations of less than 150 m. Fifty-one infested hosts were collected in T. F. Amazonas, 10 from the state of Bolivar and 1 from the state of Monagas.

Most of the Venezuelan specimens of *T. aragaoi* agree quite well with the original description and figures, differing slightly in having

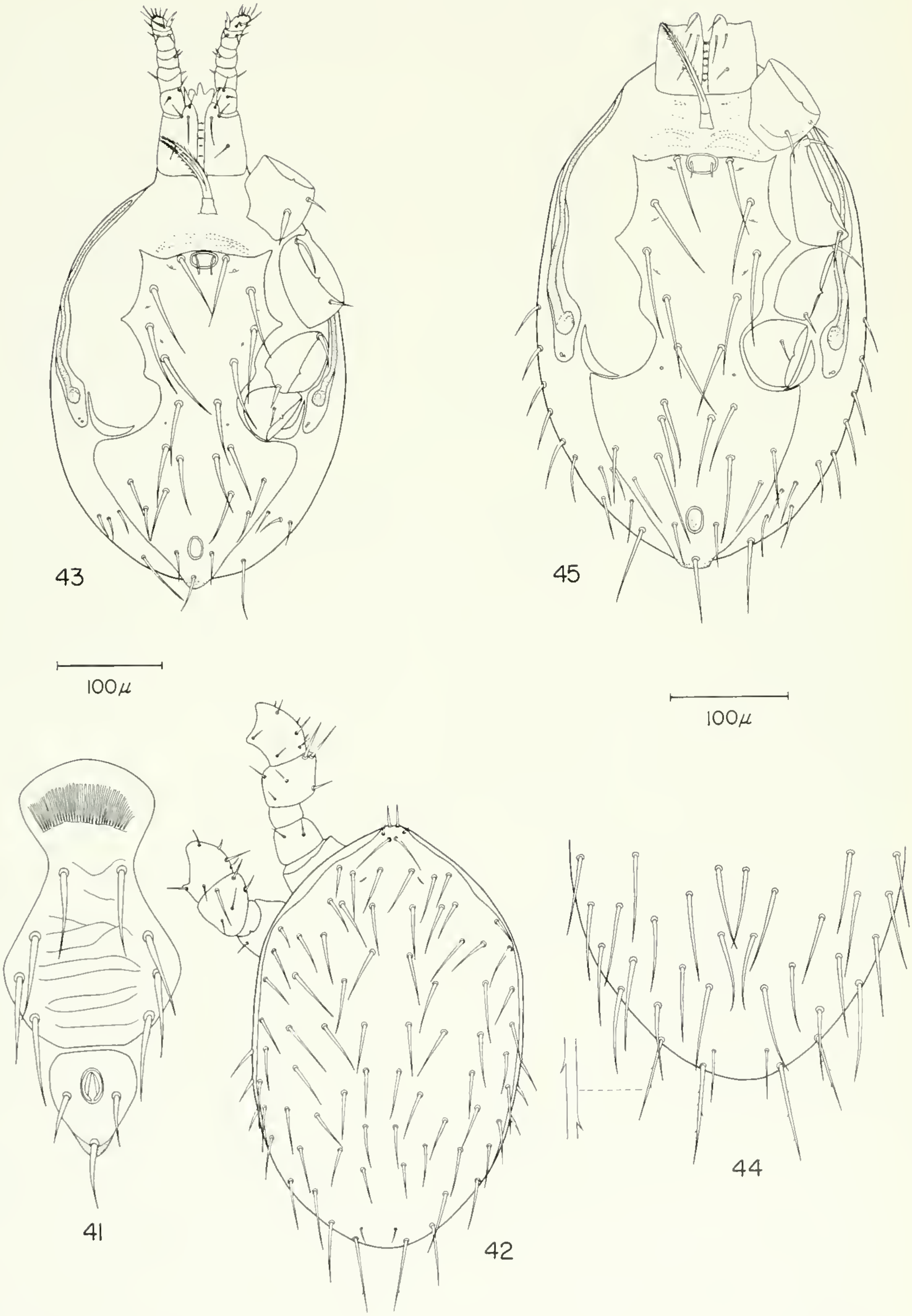


Fig. 41-45. 41-43, *Tur aragaoi* (Fonseca): 41, genitoventral and anal plate of female from *Proechimys* sp.; 42-43, dorsal and ventral views respectively of male from *Proechimys guyannensis*. 44-45, *Tur aymara* Fonseca, male from *Proechimys guyannensiss* 44. posterior end of dorsal plate; 45, ventral view of idiosoma.

longer and slimmer setae on the genitoventral plate and usually in having that plate widest at the level of setae III rather than at a level between setae III and IV. The size of the proximal spine on coxa I varies considerably in different specimens from the usual size of 33 μ long by 11 μ wide to 38 μ long by 16 μ wide. Four female specimens show variation from the majority of Venezuelan *T. aragaoi* in the size and shape of the genitoventral plate; the plate shape varies from only slightly concave posteriorly to straight (Fig. 41) and the plate in 1 specimen is only 166 μ long by 177 μ greatest width (length measured from anterior edge of genital setae trichopores to posterior median margin of plate). This compares with a length of 193 μ and width of 209 μ in typical specimens. The variant forms were taken from *Proechimys*, together with typical *T. aragaoi*, as well as with other species of *Tur*.

Description

The following description is given of the previously undescribed male of *T. aragaoi.*

Male: General facies of male similar to that of *T. apicalis* but no coxal setae are inflated and the setae of trochanters III and IV are all normal. Idiosoma 392 μ long and 231 μ wide. *Dorsum.* Dorsal plate covering essentially entire idiosoma, 386 μ long, 231 μ wide; widest at shoulders over coxae II; with 39 pairs setae well-developed, slender, except for setae z1 and J5 which are delicate, minute (Fig. 42); representative setal measurements: j5 - 49 μ, J5 - 13 μ, Z5 - 59 μ (longest setae of body); distance between trichopores of setae j5 and z5 - 42 μ. *Venter* (Fig. 43). Holoventral plate entire, reticulated, abruptly expanded behind coxae IV, bordering posterior margins of coxae IV but not extending lateral of outer coxal margins; length 316 μ, maximum width 147 μ. Sternal setae I 67 μ long, reaching almost to bases of setae III. Holoventral plate with 10 pairs of setae plus adanals and postanal seta. Adanal setae, slender, 31 μ long, arising about at mid-level of anus; postanal seta 42 μ long. About 5 pairs setae on unarmed opisthogaster varying from 25 to 55 μ long. *Gnathosoma.* Chelicerae including spermadactyl as in *T. apicalis.* Gnathosomal setae delicate, setiform, 16 μ long; inner hypostomal setae delicate, setiform, 25 μ long, reaching just to base of gnathosomals. *Legs.* Legs IV longest, about 400 μ long to tip of caruncle. Coxa I with proximal seta slim, spiniform, 31 μ long, 5 to 6 μ wide; distal seta coxa I setiform, strong, 23 μ long; posterior seta coxa II setiform, strong, 25 μ long; posterior seta coxa III spiniform, slim, 18 μ long. Femur of leg I with dorsoapical setae AD1 and PD1 enlarged, about 38 μ long; genu of leg I with dorsoproximal setae AD3 and PD3 small, and PD2 only slightly enlarged. Genu of leg IV with 9 setae.

Tur aymara Fonseca

(Fig. 44, 45)

Tur aymara Fonseca, 1960*a*:121.

Tur schistoventralis Furman and Tipton, 1961: 203.—Garrett and Strandtmann, 1967:245. [synonymized].

A total of 498 females, and 51 males of *T. aymara* was identified from 71 infested hosts collected in Venezuela: 264 females and 29 males from 27 *Proechimys semispinosus*; 21 females and 5 males from 12 *P. guyannensis;* 189 females and 16 males from 21 *Proechimys* sp.; and 1 to 2 females each from a variety of rodents and bats. The latter associations are regarded as contaminants.

Infested hosts were taken at elevations ranging from 130 to 851 m, but most were found at elevations of less than 150 m. Sixty infested hosts were collected in T. F. Amazonas, 8 from the state of Bolivar, and 1 from Apure state. Both the common host, *P. semispinosus,* and the geographic distribution of *T. aymara* were shared with *T. aragaoi.*

Description

Females of *T. aymara* collected in Venezuela agree closely with those described from Bolivia by Fonseca (1960*a*). The previously unknown male is described below.

Male: General facies as in male of *T. aragaoi* but all coxal setae except posterior seta of coxa III slim, setiform. Dorsal plate (Fig. 44) with setae J5 (posterior subterminal setae) relatively long, almost ½ as long as setae Z5 (posterior terminal setae). Idiosoma oval, 462 μ long, 290 μ wide. *Dorsum.* Dorsal plate covering essentially entire idiosoma; with 39 pairs setae well-developed, slender, setiform; representative setal measurements: j1 - 30 μ; j5 - 72 μ; J5 - 37 to 43 μ; Z5 - 80 to 86 μ; distance between trichopores of setae j5 and z5 - 37 μ. *Venter.* (Fig. 45). Holoventral plate entire, reticulated, abruptly expanded behind coxae IV but not extending lateral of outer coxal margins; length 360 μ, maximum width 191 μ. Sternal setae I 72 μ long, reaching almost to bases of setae III. Holoventral plate with 10 pairs setae plus adanal pair and postanal seta. Adanal setae slender, 40 μ long, arising posterior to mid-level of anus and extending posterior to base of postanal seta; latter 62 μ long. About 5 pairs setae on unarmed opisthogaster varying from 37 to 77 μ long. *Gnathosoma.* Chelicerae as in *T. apicalis.* Gnathosomal setae delicate, setiform, 18 μ long; inner hypostomal setae similar to gnathosomals but 24 μ long, extending almost to bases of gnathosomals. *Legs.* Legs IV longest, 478 μ to tip of caruncle. Coxa I with proximal seta slim, setiform, 37 μ long; distal slim, setiform seta 30 μ long. Posterior seta of coxa II subequal to proximal seta coxa I. Posterior seta coxa III short, strong, setiform, 22 μ long. Femora of legs I and II with dorsoapical setae AD1 and PD1 enlarged, PD1 slightly larger, 50 μ long; genua of legs I and II with dorsoproximal setae AD3 and PD3 small, PD2 larger, 32 μ long. Genu of leg IV with 9 setae.

Tur clavator, new species

(Fig. 46-49)

DIAGNOSIS OF FEMALE

A small elongate-oval species; idiosoma 700 μ long, 308 μ wide. Dorsal plate narrowly rounded posteriorly; anal plate separate. Fourth pair of genitoventral setae more closely spaced than third pair. Genitoventral plate slightly expanded behind coxae IV, almost linguiform. Following setae modified into strong, striated, club-shaped spines: setae of coxae I, posterior setae of coxae II and III, AD1 of femora I and II.

DESCRIPTION

FEMALE: *Dorsum* (Fig. 47). Dorsal plate 568 μ long, 248 μ wide, widest over coxae II and tapering to narrowly rounded posterior margin leaving broad posterior and posterolateral areas of dorsum unarmed; surface reticulated; 38 pairs setae present in usual pattern; setae z1 absent; marginal setae of s, S and r series minute. Representative dorsal plate setal lengths: j1 - 27 μ, j5 - 49 μ, J5 - 8 μ, Z5 - 55 μ, S5 - 12 μ; distance between trichopores of setae j5 and z5 - 35 μ. Unarmed portion of dorsal opisthosoma with finely striated cuticula, bearing about 9 pairs of minute setae. *Venter.* (Fig. 46). Sternal plate of modified trapezoid shape, wider posteriorly, anterior margin slightly convex, lateral margins concave but diverging posteriorly to obtusely angulate posterolateral projections; posterior margin concave; 100 μ long on midline and 130 μ wide at level of setae II; surface with reticular pattern. Sternal setae I 57 μ long extending past bases of setae II by about ⅓ of their length; trichopores separated by 55 μ; setae III 62 μ long with trichopores separated by 134 μ. Genitoventral plate narrowly elongate, extending almost to anal plate; 178 μ long from anterior margins of trichopores of genital setae to posterior margin of plate; maximum width 112 μ just posterior to second pair setae; surface striations predominantly transverse; of 4 pairs setae the genital are longest, reaching almost to level of setae II and set more closely together than other setae of plate; setae IV more closely approximated than II and III. Anal plate of inverted, narrowly pyriform shape, 92 μ long, 61 μ wide; adanal setae arising at midlevel of anus, 21 μ long, extending less than ½ distance to postanal seta; latter delicate, 25 μ long. Metapodal platelets rodlike, 34 μ long. Unarmed opisthogaster with 4 pairs minute, delicate setae. Peritremata extending to level of posterior ¼ of coxae I; broad extension of peritremalia extending behind stigmata to level of posterior margins of coxae IV, not fused with parapodal platelets. *Gnathosoma.* (Fig. 48 and 49). Chelicerae normal for genus with long membrane partially enclosing chelae, and arthrodial processes elongate, setiform; fixed chela bifid apically and with prominent, curved, setiform pilus dentilis; movable chela with pointed, inward curving tip and a subapical tooth. Hypostomal cornicles membranous. Gnathosomal setae modified into club-shaped, longitudinally striated, heavily sclerotized processes 16 μ long, 9.3 μ wide. Hypostomal setae normal, inner pair longest, 26 μ. Deutosternal groove with 5 or 6 rows of 3 to 7 denticles each. *Legs.* Coxa I with club-shaped proximal seta 15 μ long, 10 μ wide; distal seta similar but smaller. Posterior setae of coxae II and III subequal in size and shape to proximal seta of coxa I. Anterior setae of coxae II and III strong, setiform. Seta of coxa IV a minute setiform. Club-shaped setae ADI of femora of legs I and II similar to proximal spine of coxa I but smaller. Most leg setae minute, delicate. Leg chaetotaxy normal for genus; genu IV with 9 setae.

TYPE DATA: Holotype ex *Proechimys guyannensis* (E. Geoffroy) (SVP 7354), Río Supamo, 50 km SE El Manteco, Bolivar state, 150 m elev., 4-IV-66, collected by the Tuttle team. One paratype has the same collection data as the type. Three paratypes were taken from *Proechimys hoplomyoides*, 85 km SSE El Dorado, Bolivar state, 10-V-66, by the Tuttle team.

Tur expansus, new species

(Fig. 50-53)

DIAGNOSIS OF FEMALE

A small, oval species with general facies of *T. lativentralis*, with separate anal plate but

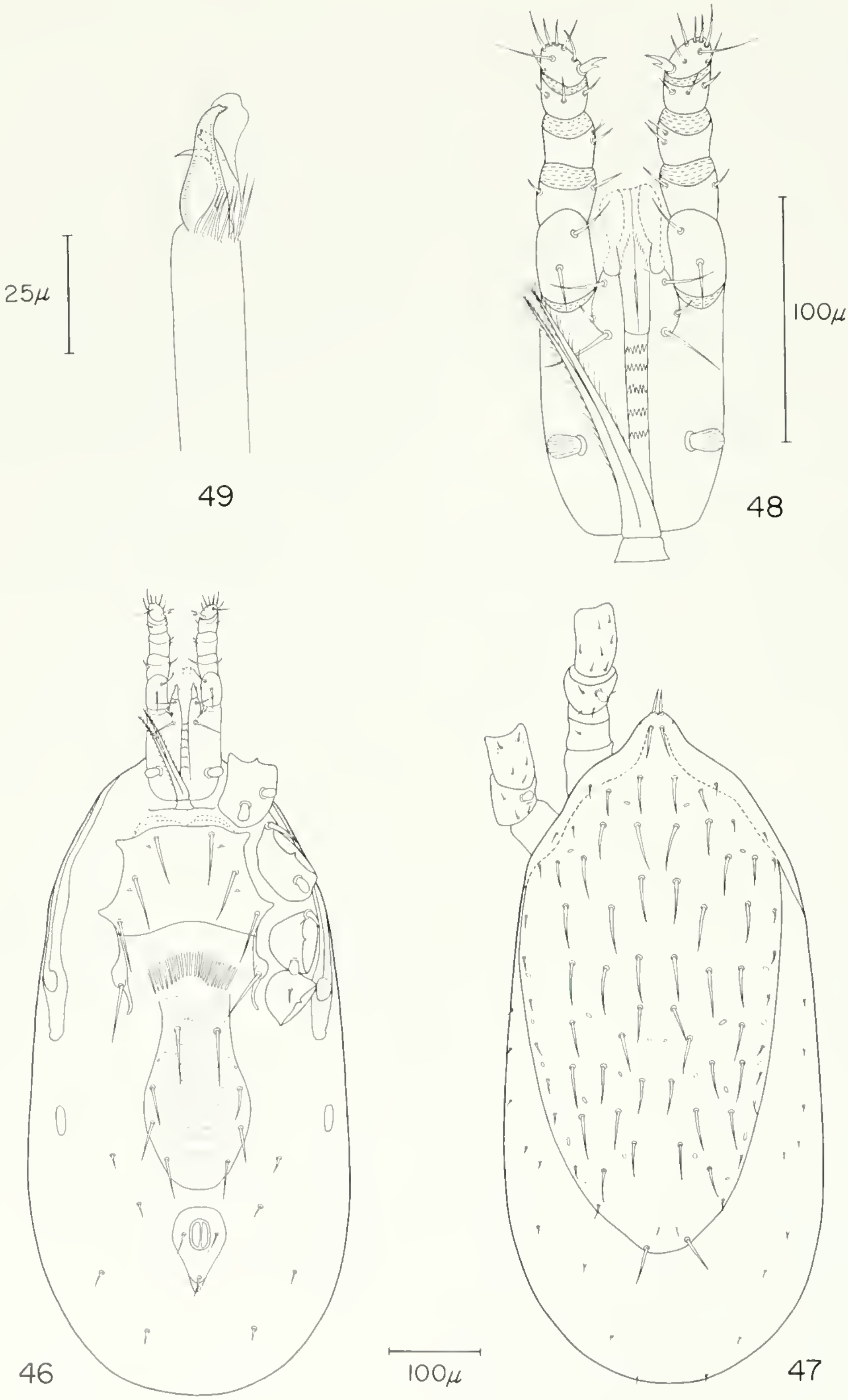

25μ
49
100μ
48
46
100μ
47

Fig. 46-49. *Tur clavator*, new species, female from *Proechimys guyannensis*: 46, ventral view; 47, dorsal view; 48, gnathosoma and tritosternum; 49, chelicera.

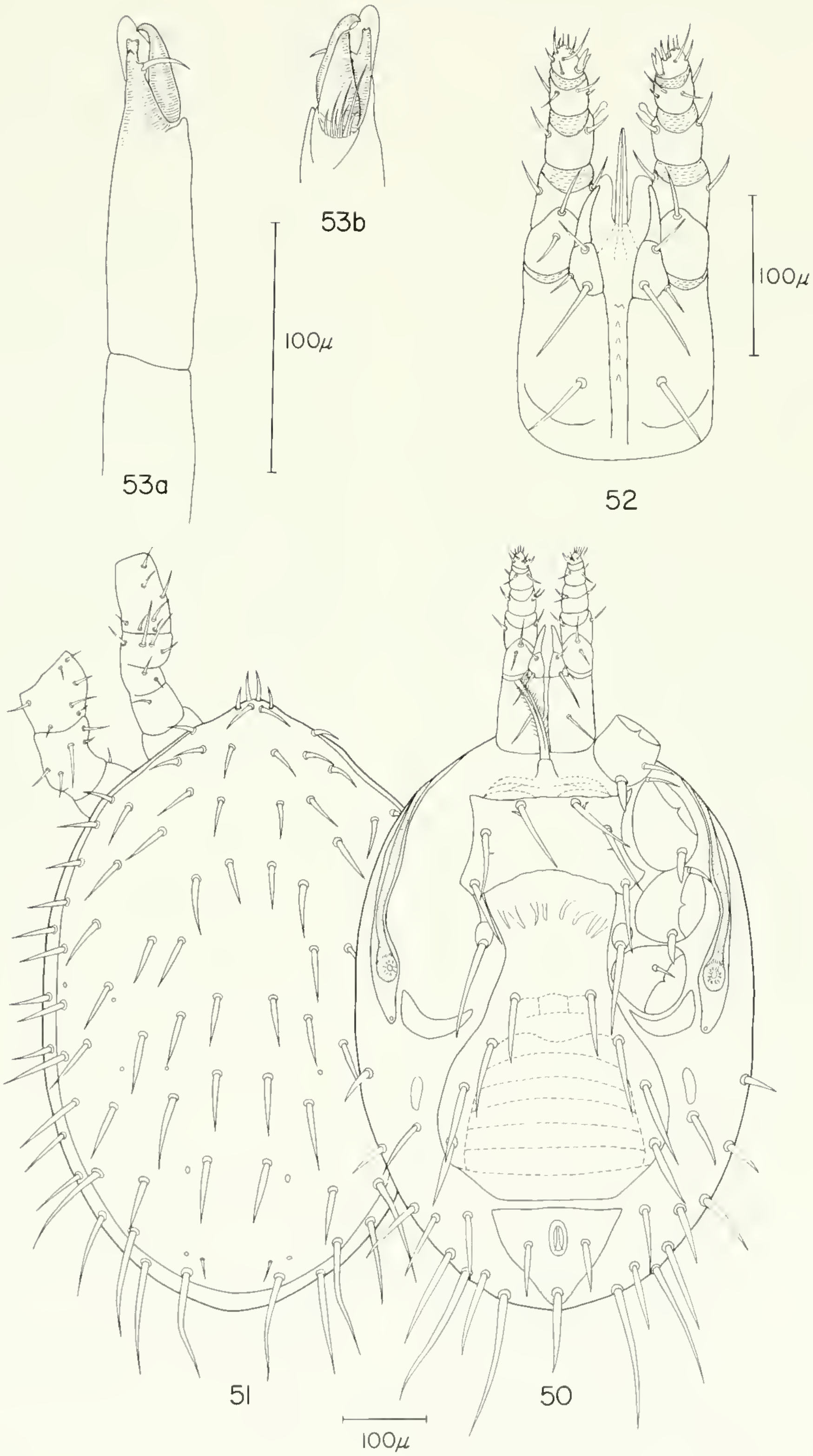

53a
53b
100μ
52
100μ
51
50
100μ

Fig. 50-53. *Tur expansus*, new species, female from *Mesomys hispidus*: 50, ventral view; 51, dorsal view; 52, gnathosoma; 53, chelicera.

with broadly expanded genitoventral plate more convexly rounded posteriorly and with setae J5 of dorsal plate minute. Idiosoma 724 μ long and 489 μ wide.

DESCRIPTION

FEMALE: *Dorsum* (Fig. 51). Dorsal plate 666 μ long, 456 μ wide, covering all but narrow lateral and posterior margins of idiosoma; surface reticulated; 39 pairs of setae present in usual pattern; setae typically relatively strong, coarse basally but tapered to very fine tip; representative setal lengths: j1 - 27 μ, j5 - 54 μ, J5 - 16 μ, Z5 - 123 μ; distance between trichopores of setae j5 and z5 - 38 μ. Marginal row of idiosomal setae strong, straight, varying from 46 μ long anteriorly to 150 μ posteriorly. *Venter* (Fig. 50). Sternal plate relatively short in relation to width, anterior margin essentially straight, lateral margins concave and posterior margin deeply concave; length on midline 82 μ, width at level of setae II 172 μ; plate with lightly reticulated surface. Sternal setae I just reach or slightly surpass posterior margin of plate and trichopores separated by 58 μ; setae III almost 100 μ long and with trichopores separated by 167 μ. Genitoventral plate broadly expanded behind coxae IV to a greatest width of 274 μ at level between setae III and IV; length of plate from anterior level of genital setae trichopores to posterior margin of plate 250 μ; plate extended behind setae IV to straight margin in juxtaposition with anal plate; 4 pairs of setae strong and located well within the boundaries of the plate, arranged in 2 diverging rows with setae IV the most widely spaced; setae III displaced slightly exterior to the line of setae from I through IV; genital setae 85 μ long, reaching well beyond bases of setae II; surface of plate with pattern of predominantly transverse striae. Anal plate triangular with straight anterior margin; length about 122 μ, greatest width 134 μ; adanal setae arise at mid-level of anus, 61 μ long reaching to postanal seta, which is stronger and about 87 μ long. Metapodal plates small, elongate and narrow. Peritremata extend to anterior level of coxae I. Peritremalia moderately broad and extending well posterior to stigmata. About 5 pairs of strong, strictly ventral setae on unarmed opisthogaster plus several marginal setae. *Gnathosoma* (Fig. 52 and 53). Chelicerae normal for genus; movable chela without teeth but with pointed apex incurved at a right angle; fixed chela distally bifid and with a small subapical tooth distal to insertion of prominent, curved, setiform pilus dentilis; chelae partially enveloped by a membrane; arthrodial processes subtending base of movable chela well-developed, extending to or beyond mid-level of chelae. Gnathosomal setae 38 μ long, strong, setiform. Inner hypostomal setae 46 μ long, not reaching bases of gnathosomals. Deutosternal groove with 6 rows of 1 to 3 teeth per row. *Legs.* Coxa I with proximal seta elongate, striated, spiniform with short acuminate tip, 34 μ long and 7 μ wide; distal seta slender, setiform, 37 μ long. Posterior seta of coxa II and III similar to proximal seta of coxa I but that of coxa III somewhat smaller. Femur of leg I with setae AD1 and PD1 moderately enlarged, about 43 μ long, appreciably larger than PD2 of genu I. AD3 and PD3 of genu I much smaller than PD2. Leg chaetotaxy typical of genus.

Only the female of *T. expansus* is known with certainty.

TYPE DATA: Female holotype and 3 paratypes ex *Mesomys hispidus* (Desmarest) (SVP 17214) SW Río Mavaca, 84 km SE Esmeralda, T. F. Amazonas at 138 m elev., 5-III-67. One paratype from the same host collected 20-II-66 at 185 m elev., Boca Mavaca, T. F. Amazonas. Other paratypes taken from *M. hispidus* collected at 138 m elev., 10 km up Río Mavaca from Boca Mavaca, T. F. Amazonas are as follows: 4 on 5-III-67, 3 on 6-III-67, 2 on 16-III-67; 1 paratype was taken at the same location on 17-III-67 from *Proechimys semispinosus*. From *M. hispidus* 14 paratypes were taken at Río Manavichi about 84 km SE Esmeralda, T. F. Amazonas, 138 m elev., 20-III-67, and 6 paratypes from 7 km down Casiquiare Canal from Capibara, T. F. Amazonas, 138 m elev., 7-VI-67. A male which is probably *T. expansus* was taken with the latter collection.

Tur subapicalis, new species

(Fig. 54-56)

DIAGNOSIS OF FEMALE

A small oval species with idiosoma 700 μ long and 430 μ wide. Anal plate separate from genitoventral plate. Fourth pair of genitoventral setae more closely spaced than third pair. Genitoventral plate widely expanded behind coxae IV. Gnathosomal and distal setae of coxa I inflated basally and with fine acuminate tip. Proximal seta of coxa I long, slim, setiform. Setae J5 of dorsal plate minute.

DESCRIPTION

FEMALE: *Dorsum* (Fig. 55). Dorsal plate 670 μ long and 376 μ wide, covering most of idiosoma; surface with reticular pattern; 39 pairs of

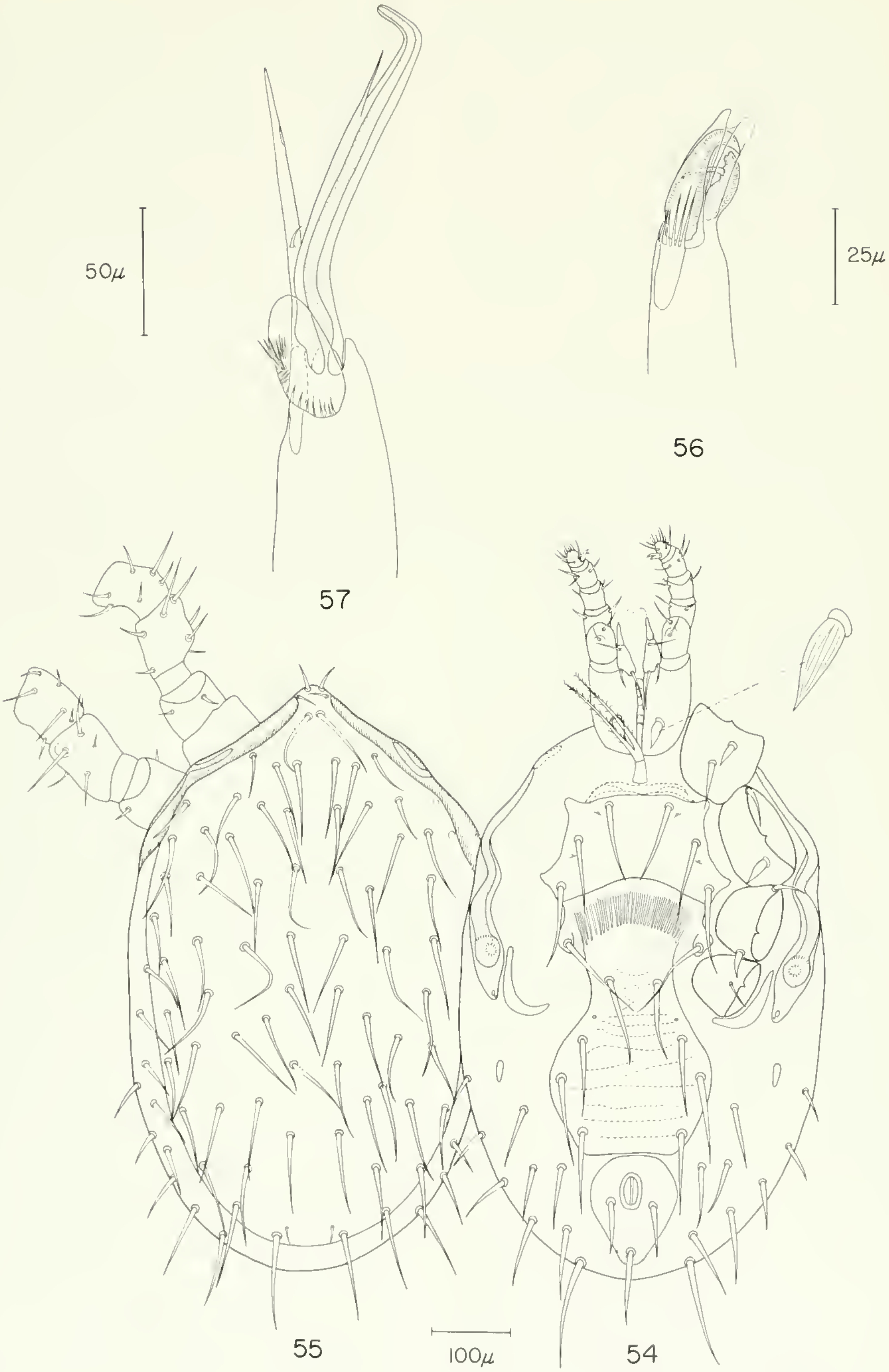


Fig. 54-57. *Tur subapicalis*, new species, female from *Proechimys guyannensis*: 54, ventral view; 55, dorsal view; 56, chelicera. 57, *Mysolaelaps heteronychus* Fonseca: chelicera of male.

slender setae in usual arrangement; representative setal lengths: j1 - 39 μ j5 - 97 μ, J5 - 19 μ, Z5 - 123 μ; distance between trichopores of setae j5 and z5 - 43 μ. Posterior marginal setae of dorsal plate and idiosoma minutely barbed. Dorsolateral and posterior marginal setae of idiosoma strong but slightly smaller than adjacent setae of dorsal plate. *Venter* (Fig. 54). Sternal plate of modified trapezoid shape, wider posteriorly, anterior margin slightly convex, lateral margins concave but diverging posteriorly, and posterior margin concave; 100 μ long on midline and 170 μ wide at level of setae II; surface with reticular pattern. Sternal setae I 97 μ long, just reaching posterior margin of plate and with trichopores separated by 64 μ; setae III 103 μ long with trichopores separated by 166 μ. Genitoventral plate transversely striated, moderately expanded posterior to coxae IV to greatest width of 188 μ at level of genitoventral setae III; length of plate from anterior margins of genital setae trichopores to posterior margin of plate 215 μ; posterior margin of plate straight to convex. Genitoventral setae IV more closely spaced than setae III; all setae of plate elongate, setiform, with first pair 98 μ long, reaching level about ⅔ distance between bases of setae II and III. Anal plate relatively narrow, of inverted pyriform shape, 126 μ long and 103 μ wide; adanal setae arising at level of posterior end of anus, 67 μ long, reaching just past base of postanal seta which is stronger and 93 μ long. Metapodal plates small, elongate, narrow. Peritremata extend to mid-level of coxae I. Peritremalia broad and with broad extension posterior to stigmata. Unarmed opisthogaster with 5 pairs of strictly ventral setae and several submarginal to marginal setae. *Gnathosoma.* Chelicerae (Fig. 56) normal for genus with long membrane partially enclosing chelae and with relatively elongate arthrodial setiform processes arising at base of movable chela. Fixed chela bifid apically and with prominent, curved, setiform pilus dentilis. Movable chela lacking teeth but with pointed tip curved inward at right angle. Gnathosomal setae 32 μ long, striated, with bulbous base over 9 μ wide and with slender acuminate tip. Inner hypostomal setae 54 μ long, slim, setiform. Deutosternal groove with about 6 rows of indistinctly visible teeth. *Legs.* Coxa I with proximal seta slim, striated, spiniform, 55 μ long by basal width of 6 μ; distal seta 32 μ long, somewhat inflated basally, striated, spiniform, with acuminate tip. Posterior setae of coxae II and III inflated, striated, spiniform, with acuminate tip; lengths 37 and 33 μ respectively. Femur of leg I with dorsoapical setae enlarged: AD1 - 51 μ long, PD1 - 63 μ long; genu with proximodorsal setae AD3 and PD3 short, about 20 μ, but PD2 long, 59 μ. Femur and genu of leg II with relative strengths of setae as described for leg I. Leg chaetotaxy normal for genus.

Only the female of *T. subapicalis* is known with certainty.

TYPE DATA: Holotype and 4 paratypes ex *Proechimys guyannensis* (E. Geoffroy) (SVP 16400), at Belén, Río Cunucunuma, T. F. Amazonas at 150 m elev. From the same host species and locality were taken 4 paratypes on 3-I-67, 1 paratype on 4-I-67, and 7 paratypes on 17-I-67; with the latter were taken 2 males which probably are *T. subapicalis.* Additional collections of *T. subapicalis* are as follows: 4 females taken 2-I-67 from same host species and locality as holotype; 1 female, 4-I-67 from the same location on *Zygodontomys brevicauda*; 1 female, 19-IX-67 from *P. guyannensis* at 114 m elev., Paria, 25 km SSE Puerto Ayacucho, T. F. Amazonas; 1 female and 1 male (?), 5-VII-67, from *Proechimys* sp. at 155 m elev., San Juan, Río Manapiare, T. F. Amazonas.

Included with the collections of *T. subapicalis* were *T. apicalis* and *T. aragaoi,* both of which bear resemblance to *T. subapicalis.* There seems a definite possibility that some described species of *Tur* may prove on further study to represent hybrid forms, but morphological differences are such that colonization studies or the discovery of more complete intergradation would be necessary to verify this possibility.

T. subapicalis differs from *T. apicalis* in having the anal plate separate from the genitoventral plate, a feature which only rarely varies (see discussion of Form 2 of *T. apicalis*), in having the proximal seta of coxa I setiform instead of bulbous, and in lacking asymmetrically enlarged setae on trochanters of legs III and IV. *T. subapicalis* differs from *T. uniscutatus* in having a separate anal plate, bulbous gnathosomal setae with acuminate tips and genitoventral setae IV more closely spaced than III. It differs from *T. aragaoi* in having the posterior margin of the genitoventral plate straight to convex.

Genus *Mysolaelaps* Fonseca

Mysolaelaps Fonseca, 1936*a*:17.

Type Species: *Mysolaelaps parvispinosus* Fonseca

Mysolaelaps consists of large laelapid mites found primarily on cricetid rodents of the tribe Hesperomyini. The idiosoma of *Mysolaelaps* is usually over 1150 μ long with dorsal plate covering almost entire dorsum. Setae of dorsal plate of female minute to small except for anterior and posterior marginals. Genitoventral plate of female large, expanded behind coxae IV, with broadly rounded to concave posterior margin; with 4 pairs of marginally located setae but fourth pair at times located just off posterior margin of plate. Coxae with setiform setae. Leg chaetotaxy as described by Evans and Till (1965) for most holotrichous free-living dermanyssoid mites, except that genu IV has 10 rather than 9 setae.

Of the 3 known species of Neotropical *Mysolaelaps*, all are represented in the currently reported Venezuelan collections. *Laelaps rothschildi* Hirst, 1914, a species virtually host specific for murid rodents of the genus *Melomys* in Australia and New Guinea may belong in the genus *Mysolaelaps*, as suggested by Fonseca (1959), but its placement remains inconclusive pending further study.

Key to Neotropical Species of *Mysolaelaps*[4]
Females

1. All genitoventral setae minute, approximately equal in size. Legs 2 to 4 each with gross enlargement of 1 of the paired ambulacral claws .... *M. heteronychus* Fonseca, 1959

   At least 1 pair genitoventral setae 65 μ or longer, 4th pair much longer than 1st pair. Legs 2 to 4 each with paired ambulacral claws subequal 2

2. All sternal setae small, approximately equal in size. First and 2nd pairs genitoventral setae less than ½ length of 3rd and 4th pairs .... *M. microspinosus* Fonseca, 1936

   Third pair sternal setae approximately twice as long as 1st pair. First and 2nd pairs genitoventral setae more than ½ length of 3rd and 4th pairs .... *M. parvispinosus* Fonseca, 1936

Mysolaelaps heteronychus Fonseca

(Fig. 57)

Mysolaelaps heteronychus Fonseca, 1959:145.

A total of 1292 females, 2 males and 2 nymphs of *M. heteronychus* was identified from 154 infested hosts collected in Venezuela. Species of *Rhipidomys* were the most common hosts. Fifty-eight *R. venustus* yielded 523 mites; 24 *R. venezuelae* yielded 306 females and 1 male, and 32 *R. macconnelli* yielded 154 specimens. *R. caucensis* and *R. couesi* were less frequently found infested. Hosts found infested on 2 to 4 occasions each include *Oryzomys minutus*, *O. albigularis*, and *O. capito*. Several other cricetine rodents were found infested on single occasions as were man, marsupials, bats and a bird. These are regarded as accidental associations.

M. heteronychus was collected at elevations ranging from 4 to 3270 m, a reflection of its capacity to thrive on hosts such as *R. venezuelae* at low elevations and *R. venustus* at higher elevations. The states or regions from which the mite was collected, listed in order of greatest to least frequency, are: T. F. Amazonas, Tachira, Trujillo, Bolivar, Falcon, Monagas, Merida, Dto. Federal, Sucre, Nueva Esparta, Lara and Barinas.

Females of *M. heteronychus* from Venezuela agree well in most respects with Fonseca's original description (1959). The first pair of genitoventral plate setae is well inside the lateral margins of the plate and not marginal as illustrated by Fonseca; setae 2 through 4 may be strictly marginal or may appear just off the plate on the striated cuticula. This is most frequently the case with setae 4.

DESCRIPTION

The following description of the male of *M. heteronychus* represents the first description of a male of this genus. Males have been found rarely on hosts and presumably are almost exclusively nest inhabitants.

MALE: General facies similar to that of female; a large mite with complete holoventral plate, small central setae on dorsal plate and vestigial claws on legs I. Idiosoma 1047 μ long and 725 μ wide. *Dorsum.* Dorsal plate covering idiosoma; most setae broken on the single male available for description, but marginal setae well developed: setae j1 - 67 μ long, j5 - 40 μ, J5 - 49 μ, S5 - 180 μ long. Distance between trichopores of setae j5 and z5 - 110 μ. *Venter.* Holoventral plate entire, reticulated; lateral margins with deep concavities opposite each of coxae II to IV and widely expanded behind coxae IV to level of outer margins of coxae, thence diminished in width in a convex arc to posterior extremity. Setae I of holoventral plate broken but much slimmer than setae II; setae II through IV each reach well beyond trichopores of next posterior setal pair. In addition to 5 pairs setae in podosomal region, holoventral plate bears 10 pairs of trichopores in opisthogastric area as well as 3 anal setae (all opisthogastric setae broken or missing). Peritremata slim, extending anteriorly to mid-level of coxae II. Peritremalia slim, not extending posterior to stigmata, but pair of small pores present posterior to stigmata as in female. *Gnathosoma.* Chelicera (Fig. 57) with spermadactyl about 150 μ long, tubular, of decreasing diameter distally and curved in a gentle to acute arc; apparently flexible, partially fused basally with membranous movable digit which extends 5/6 length of spermadactyl with free setalike tip. Fixed digit straight, bristlelike, about ¾ as long as spermadactyl and with dorsal seta on proximal ¼. Arthrodial membrane well developed with short, setalike arthrodial processes. Gnathosomal setae small, 33 μ long; inner hypostomal setae 59 μ long, extending to bases of gnathosomal setae. Deutosternal groove with 12 rows of 2 to 4 denticles each. *Legs.* Relative size of legs as in female. All coxal setae setiform. Small anterodorsal spur on coxa II. Claws of legs II to IV normal, but those of tarsi I vestigial. Dorsoapical setae AD1 of femur I somewhat enlarged, 61 μ long. Proximodorsal setae of genu I not enlarged. Setae AD1 and PD1 of femur II subequal, 40 to 43 μ long. Genu IV with 10 setae.

---

[4] Modified from Furman and Tipton, 1961

The male is described from a single specimen taken from *Rhipidomys venezuelae* (SVP 24206) together with 12 female *M. heteronychus* on 1-VIII-68, by the Peterson team at Cerro Santa Ana, 49 km N and 32 km W Coro, Falcon, Venezuela.

Mysolaelaps microspinosus Fonseca

Mysolaelaps microspinosus Fonseca, 1936*a*:18.—Fonseca, 1959:144 [Figures].

A total of 69 females of *M. microspinosus* was identified from 33 infested hosts collected in Venezuela: 48 from 26 *Oryzomys minutus*, 18 from 4 *Oryzomys* sp., 1 each from *Rhipidomys macconnelli*, *Thomasomys laniger* and a bird.

M. microspinosus was found primarily at high elevations of over 2400 m, with collections ranging in elevation from 1400 to 3540 m. The states from which the mite was collected, listed in order of greatest to least frequency, are: Merida, Tachira, Sucre, Trujillo and T. F. Amazonas.

Mysolaelaps parvispinosus Fonseca

Mysolaelaps parvispinosus Fonseca, 1936*a*:17.—Fonseca, 1959:151 [Figures].

A total of 206 females of *M. parvispinosus* was identified from 77 infested hosts collected in Venezuela: 187 from 69 *Oryzomys fulvescens*, 7 from 3 *Oryzomys* sp., 2 from 1 *Neacomys tenuipes*, 1 from *Zygodontomys brevicauda*, 1 from *Heteromys anomalus*, 5 from 1 *Cavia porcellus* and 3 from 1 *Molossus ater*.

M. parvispinosus was collected at elevations ranging from 1 to 1977 m, with most of the specimens taken at less than 1500 m elevation. The states (or district) from which the mite was collected, listed in order of greatest to least frequency, are: Monagas, Bolivar, Falcon, Carabobo, Sucre, Miranda, Lara, Zulia, Guarico, Dto. Federal.

Genus *Hymenolaelaps*, new genus

Diagnosis (based on female)

Dorsal and ventral armature weakly sclerotized. Dorsal plate covering most of idiosoma, with 37 pairs of minute to small setae. Tritosternum well developed with fimbriated laciniae. Genitoventral plate truncate posteriorly, with 3 pairs setae. Peritremata slim with peritremalia poorly developed and not fused with parapodal plates. Tectum (Fig. 59b) strongly fimbriated and elongated. Movable digit of chelicera with minute tooth; fixed digit membranous. Hypostome with prominent transverse striations. Deutosternum with 6 rows of 3 to 4 denticles per row. Genu of leg IV with 9 setae. Tibiae of legs III and IV with 8 setae.

Type Species: *Hymenolaelaps princeps*, new species

Hymenolaelaps princeps, new species

(Fig. 58-61)

Diagnosis

As for genus.

Description

Female: Idiosoma narrowly oval, 572 μ long, 344 μ wide. Dorsal plate (Figure 59a) weakly sclerotized, covering essentially entire idiosoma, 561 μ long, 344 μ wide; bearing 37 pairs of small, delicate setae in pattern typical of *Laelaps* but lacking setae z1 and z2; representative setal lengths: j1 - 19 μ, j5 - 6 μ, J5 - 13 μ, Z5 - 21 μ; distance between trichopores of j5 and z5 - 43 μ. A single row of about 11 marginal idiosomal setae slightly larger than adjacent setae of dorsal plate. *Venter* (Fig. 58). Sternal plate 101 μ long on midline and 133 μ

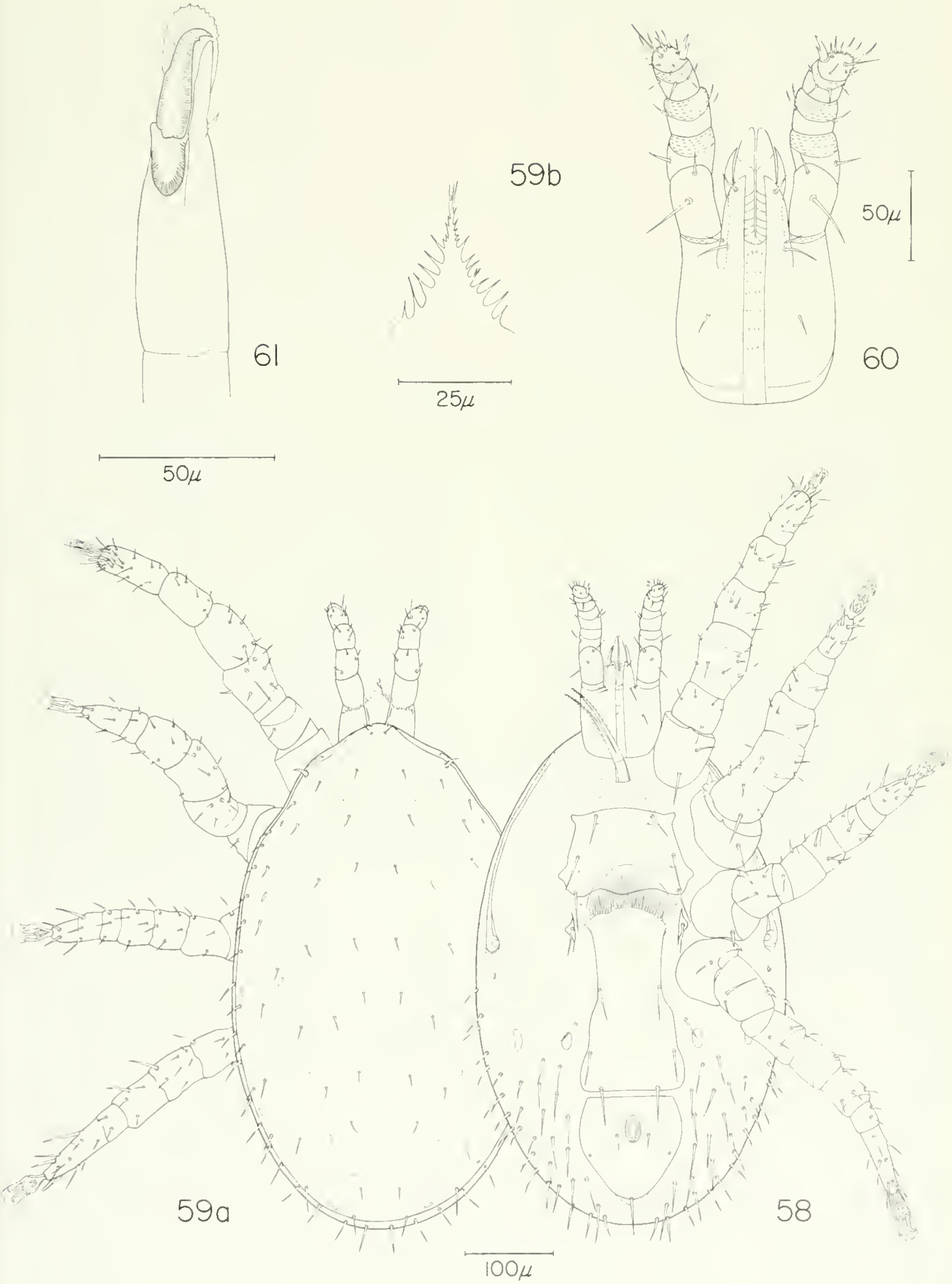

61
50μ
59b
25μ
50μ
60
59a
58
100μ

Fig. 58-61. *Hymenolaelaps princeps*, new genus, new species, female from *Thomasomys lugens*: 58, ventral view; 59a, dorsal view; 59b, tectum; 60, gnathosoma; 61, chelicera.

wide at level setae II, lightly sclerotized, roughly trapezoidal, anterior margin slightly convex, lateral margins slightly concave and diverging posteriorly to obtusely angulate posterolateral lobes bearing third pair of setae; posterior margin with median projection and 2 submedian indentations; plate with usual 3 pairs setae and 2 pairs of lyriform pores; setae I arising on anterior margin, 37 μ long, not extending to bases of setae II and with bases of setae I separated by 61 μ. Metasternal setae subequal to sternal setae I and arising from boomerang-shaped metasternal platelets. Genitoventral plate urn-shaped, broadly truncate posteriorly; lateral margins convexly swollen posterior to genital setae, indented at level of setae II and swollen to maximum width between setae II and III; 122 μ long from anterior level of genital setae trichopores to posterior margin; greatest width 126 μ; setae I 35 μ long reaching ½ distance to bases of setae II; setae I and II arising on lateral margins, setae III on posterior margin; setae II more widely spaced than other setae of plate; pair of flanking setae on unarmed cuticula between seta I and II of genitoventral plate. Anal plate a modified broad pyriform with anterior margin straight; length subequal to width and subequal to greatest width of genitoventral plate. Adanal setae set at level of posterior ¼ of anus, 25 μ long, reaching about ⅓ of distance to postanal seta; latter 44 μ long. Metapodal platelets sausage-shaped, 25 μ long; a pair of similar but smaller platelets near genitoventral plate margins at level of metapodal platelets. Peritremata thin, extending to anterior ⅓ of coxae I. Peritremalia with slim, poorly sclerotized posterior extension including a subterminal pore behind stigmata. Unarmed opisthogaster with about 25 pairs setae, larger posteriorly to maximum length of 44 μ. *Gnathosoma* (Fig. 60 and 61). Chelicerae with movable digit well developed, with minute subapical tooth and with tip curved and terminating in sharp point. Arthrodial processes subtending base of movable digit in an elongate oval arrangement. Fixed digit membranous with small dorsal seta near its base; membrane extends distal to movable digit with prominently rayed distal crown resembling the feathered headdress of an American Indian chieftain. Deutosternal groove with 6 rows of 3 to 4 denticles per row and with additional scattered denticles apically. Gnathosomal setae delicate, 10 μ long; inner hypostomal setae 14 μ long, longer than outer and distal hypostomals. Palpal chaetotaxy formula 2, 5, 6, 12. *Legs.* All coxal setae setiform except anterior spiniform seta of coxa III and the weakly spiniform anterior seta of coxa II. Coxa I with proximal seta 34 μ long; distal seta 21 μ long. Coxa II with a well-developed anterodorsal spur. Femur of leg I with apical pair of dorsal setae enlarged; AD1 about 30 μ long, PD1 - 43 μ long; genu of leg I with seta PD2 - 22 μ long.

Chaetotaxy of legs given in Table 4. Deficiency noted only on tibia IV which has 8 rather than the 10 setae normally found in holotrichous freeliving dermanyssoid mites.

Type Data: Female holotype and 2 paratypes ex *Thomasomys lugens* (Thomas) (SVP 4442), Middle Refugio, 5 km E and 1 km S Tabay, Merida, Venezuela, 2710 m elev., 15-IV-66 by the N. Peterson team. Other paratypes, all females, are: 17 from 3 *T. hylophilus* 35 km S and 22 km W San Cristobal, Tachira at 2400 m elev.; 4 from 3 *T. aureus* from the same locality at 2385 m elev.; 4 from 2 *Thomasomys* sp. 5.5 km E and 2 km S Tabay, Merida at 2580 and 2670 m elev.; 1 from *Proechimys guyannensis* at El Manaco, 59 km SE El Dorado, Bolivar at 150 m elev.; 1 from *Oryzomys* sp. and 1 from *Caenolestes* sp. 35 km S and 22 km W San Cristobal, Tachira at 2400 m elev.

H. princeps is intermediate in characteristics between laelapid and macronyssid mites and has several characteristics in common with the macronyssid *Liponysella madagascariensis* (Hirst) from lemurs of Madagascar. The latter differs in numerous basic features, however, such as a single column of deutosternal teeth, well-developed fixed digit of chelicera with 2 terminal hyaline processes, macronyssine type of dorsal plate with much reduction of dorsal plate setation, and fusion of peritremalia with parapodal plates.

TABLE 4.
Leg chaetotaxy of *Hymenolaelaps princeps*

	I	II	III	IV
Coxa	2	2	2	1
Trochanter	6	5	5	5
Femur	13	11	6	6
Genu	13	11	9	9
Tibia	13	10	8	8

Hymenolaelaps bears a superficial resemblance to *Neolaelaps* Hirst, 1926, a genus of laelapid mites found only on fruit-eating bats in the Australian and Oriental zoogeographic realms. *Neolaelaps* differs in numerous features, including very large peritreme, long dorsal plate setae, including setae z1 and z2, presence of some spiniform coxal setae, corniculi lacking or indistinct in female, and 10 or more rows of deutosternal teeth in single or double file. The genus *Chrysochlorolaelaps* Evans and Till, 1965*a*, also resembles *Hymenolaelaps* superficially. It is distinguished by its hyaline, flaplike hypostomal corniculi, strong retrose spurs on basis capituli, lack of setae z3 and px series on dorsal plate, hypertrophied setae of coxae 1 and 2, smooth tectum and tibia IV with 10 setae. Resemblances of *Hymenolaelaps* to the above genera are not supportive of common ancestry. The new genus represents an instance of independent evolution of elongate, non-grasping, weakly toothed chelae in the Laelapinae.

Genus *Steptolaelaps* Furman

Steptolaelaps Furman, 1955:519.

Type Species: *Neolaelaps heteromys* Fox

The 2 known species of *Steptolaelaps* are found primarily on heteromyid rodents. The geographic distribution ranges from the Neotropical region northward to Texas in the United States. The genus is distinguished from all other laelapid genera on the basis of the following combination of characters: 3 pairs of setae on the genitoventral plate of the female; robust spines on coxae I to III and on the trochanter and femur of leg I; strong spines on the dorsum; simple lobate tectum; chelicerae of both sexes each with a large, toothed, movable digit opposed to a reduced, simple fixed digit and with elongate arthrodial processes. Leg chaetotaxy corresponds exactly to the holotrichous condition described for free-living dermanyssoid mites by Evans and Till (1965).

Steptolaelaps heteromys (Fox)

Neolaelaps heteromys Fox, 1947:119.

Steptolaelaps heteromydis Furman, 1955:521.

Steptolaelaps heteromys, Furman and Tipton, 1961:195.

A total of 840 females, 550 males and 80 nymphs of *S. heteromys* was identified from 142 infested hosts collected in Venezuela. The common host was *Heteromys anomalus*: 113 hosts yielded 773 females, 523 males and 77 nymphs. From 5 *Heteromys* sp. there were taken 37 females, 16 males and 2 nymphs. From 7 *Zygodontomys brevicauda* there were taken 11 females, 5 males and 1 nymph. One to 4 mites each were taken from a wide variety of other rodents, bats, a marsupial, an edentate and a bird; these are considered accidental associations.

Hosts infested with *S. heteromys* were taken at elevations ranging from 5 to 2126 m. The states (or district) from which they were collected, listed in order of greatest to least frequency, are: Sucre, Falcon, Dto. Federal, Trujillo, Miranda, Yaracuy, Aragua, Monagas, Guarico, Barinas, Zulia, T. F. Amazonas.

Specimens of *S. heteromys* showed little morphological variation, agreeing well with the figures and description given by Furman (1955) and Tipton et al. (1966).

S. heteromys is the only species of the genus known from Venezuela. It differs from *S. liomydis* (Grant) in that the movable digit of the female chelicera bears 2 teeth in addition to the terminal prong, and 6 long arthrodial processes arise from the base of the digit, while in *S. liomydis* there is only 1 tooth on the movable digit and 1 long and 1 short arthrodial processes. Among other differential features, the gnathosomal setae of *S. heteromys* are long and tapering, while in *S. liomydis* they are short, thick spines, resembling those of coxae I.

Genus *Neoparalaelaps* Fonseca

Neoparalaelaps Fonseca, 1937:58 [= *Paralaelaps* Fonseca, 1936*b*, preoccupied by *Paralaelaps* Tragardh, 1908].

Type Species: *Neoparalaelaps bispinosus* (Fonseca)

The Neotropical, monotypic genus *Neoparalaelaps* is considered here as a member of the subfamily Hirstionyssinae Evans and Till 1966. In most respects, the genus fits well in the subfamily and more particularly shows similarities to *Patrinyssus* Jameson 1950. It differs from the diagnosis of the subfamily given by Herrin (1970) only as follows: in the female, the movable digit of the chelicerae is toothed and the fixed digit bears a relatively large ribbonlike process which has been described as a pilus dentilis but could be interpreted as a hyaline process; dorsal shield is hypotrichous but less so than typical for Hirstionyssinae, bearing 32 to 35 pairs of setae in the female, including a vestigial pair of setae zI; chaetotaxy of legs normal except that genu IV bears 11 setae.

Neoparalaelaps bispinosus (Fonseca)

(Fig. 62-66)

Paralaelaps bispinosus Fonseca, 1936*b*:29.

Neoparalaelaps bispinosus, Fonseca, 1937:58.

A total of 9 females and 4 males of *N. bispinosus* was identified from Venezuela: 8 fe-

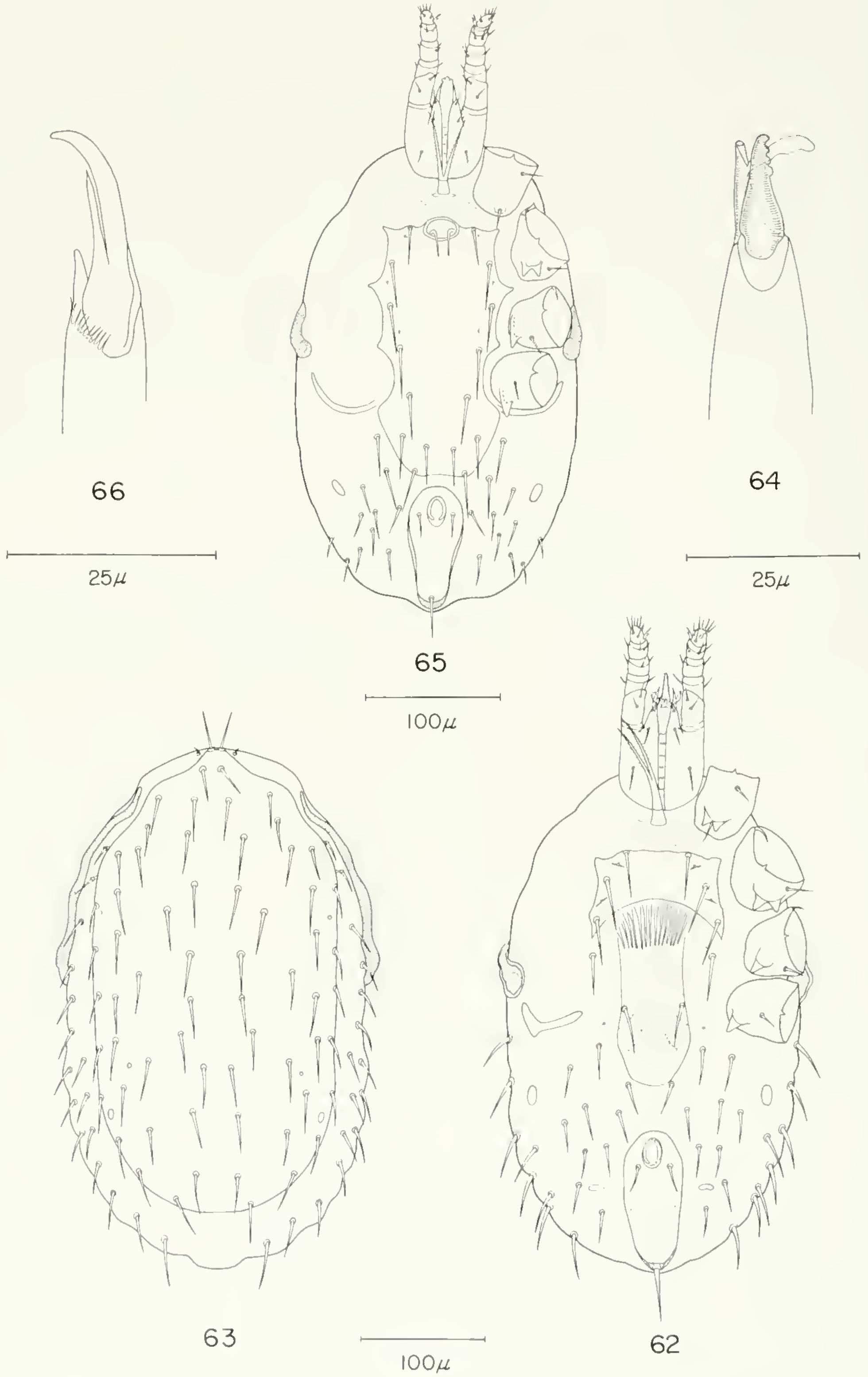

66
25μ
65
100μ
64
25μ
63
100μ
62

Fig. 62-66. *Neoparalaelaps bispinosus* (Fonseca), from *Cavia porcellus,* Monagas state: 62, ventral view of female; 63. dorsal idiosoma of female 64, chelicera of female; 65, ventral view of male; 66, chelicera of male.

males and 4 males were taken from 3 hosts (2 *Cavia porcellus* and 1 *Molossus ater*) at San Agustin, 3 km N and 4 km W Caripe, Monagas, 1180 m elev., June and July 1967; 1 female was taken from *C. porcellus* at the Hato San Fernando, 2 km N and 2 km W Caripe, Monagas, 1180 m elev., 14-VI-67.

The females of *N. bispinosus* taken in Venezuela agree reasonably well with Fonseca's original description and figures. The Venezuelan specimens differ in that the sternal plate is more shallow than given by Fonseca, measuring about 42 μ long on midline by a width at level of setae II of 94 μ; there are only 10 instead of 12 pairs of strictly ventral setae on the unarmed opisthogaster (Fig. 62); the 2 elongate platelets noted by Fonseca between the metapodals and coxae IV are not evident; the dorsal plate bears 35 pairs of setae instead of the 34 described by Fonseca, but of these the minute pair z1 and pairs r3 and r4 are actually off the plate, with a basal sclerotized connecting strip to the plate. Setae s1, s2, r1, r2, r6 and px3 are absent (Fig. 63). Other characteristics noted on Venezuelan female specimens are as follows. Tectum membranous, an irregularly rounded lobe. Movable digit of chelicera with 3 teeth (Fig. 64); arthrodial processes not visible; fixed digit with large, membranous, ribbonlike pilus dentilis. Peritremata broad, moving dorsally over coxae III and extending dorsally to level of posterior margins of coxae I. Peritremalia either absent or greatly reduced, not visible posterior to stigmata. Segmental chaetotaxy of coxae through tibiae of legs I to IV as given by Evans and Till (1965) for free-living dermanyssoid mites, except for presence of 11, rather than 9, setae on genu IV. Coxae II with small anterodorsal spur.

DESCRIPTION

The following description is given of the previously unknown male of *N. bispinosus*.

MALE: Small mite with general appearance of female; coxae with identical arrangement of spines and setae except that the proximal bifurcate spur of coxa I seen in females is reduced in male to a rectangular projection giving rise to proximal seta. Sternoventral plate separate from anal plate. Peritremata broad, short, extending only to mid-level of coxae III. Idiosoma 354 μ long, 226 μ wide. *Dorsum*. Dorsal plate similar to that of female but differing in having shoulders broader over coxae II, including setae r3 and r4 within body of plate, and in including setae s2, which are lacking in female; 36 pairs setae on plate. Representative setal measurements: j1 - 17 μ, z1 - 6 μ (minute but larger than in female), j5 about 35 μ, J5 - 24 μ, Z5 - 37 μ. *Venter* (Fig. 65). Sternoventral plate 192 μ long, expanded slightly posterior to coxae IV with truncate posterior border about 12 μ from anal plate; usual 5 pairs setae in podosomal region, slim, each pair extending to or beyond bases of succeeding pair; 3 pairs similar setae in opisthosomal region; posterior pair on caudal margin of plate. Anal plate and metapodal platelets as in female. About 9 or 10 pairs of setae on unarmed opisthogaster. Peritremata broad, short, extending anterodorsally from stigmata, located laterally at level between coxae III and IV, to mid-level of coxae III. Peritremalia apparently absent. Parapodal platelets each a narrow apodeme bordering posterolateral margin of coxa IV. *Gnathosoma.* Chelicerae (Fig. 66) resembling generalized *Laelaps* type, with spermadactyl 30 μ long, grooved, of diminishing diameter apically and curved in gentle arc; movable digit a membranous, apically pointed lobe extending about ¾ length of spermadactyl and partially fused with it; arthrodial processes short, setiform; fixed digit a short, poorly sclerotized lobe, pilus dentilis doubtfully present, indistinct. Deutosternal groove with 6 rows of 3 to 5 denticles each. In other features similar to female. *Legs.* As in female with exception as indicated above for coxae I.

Genus *Androlaelaps* Berlese

Androlaelaps Berlese, 1903:14.—Till 1963:14 [synonymy list].

Type Species: *Laelaps* (*Iphis*) *hermaphrodita* Berlese, 1887.

The concept of the genus *Androlaelaps* followed here is that advanced by Till (1963), whose work represents the most comprehensive recent review of the genus. Chaetotaxy of legs I to IV respectively for females of all Venezuelan species is as follows: trochanter - 6, 5, 5, 5; femur - 13, 11, 6, 6; genu - 13, 11, 9, 10; tibia - 13, 10, 8, 10. This agrees with the number considered normal for the genus by Till (loc. cit.).

Key to Species of Venezuelan *Androlaelaps*
Females

1. Femur II with a stout, blunt spiniform seta on its ventral surface (*Androlaelaps* group) 2
Femur II with only simple setae on its ventral surface (*Haemolaelaps* group) 3

2. Posterior margin of sternal plate with median projection. Central setae of dorsal plate well developed, extending to or almost to, bases of next posterior setae. Pilus dentilis large, setiform .... *A. projecta*, new species
Posterior margin of sternal plate concave medially. Central setae of dorsal plate delicate, short, not extending over ½ distance to bases of next posterior setae. Pilus dentilis short, fine .... *A. foxi* Fonseca, 1959

3. Femur of leg I with anterodorsal seta (AD1) enlarged, spiniform, with length subequal to width of femur at level of seta. Setae j5 of dorsal plate minute, about ¼ as long as distance from base of j5 to z5 .... *A. rotundus* (Fonseca, 1936)
Femur of leg I with seta AD1 not enlarged or spiniform, or if somewhat enlarged length much less than width of femur at level of seta. Setae j5 of dorsal plate medium to long; length about ½ or more the distance from base of j5 to z5 4

4. Pilus dentilis slightly to broadly inflated basally 5
Pilus dentilis a slender setiform .... *A. casalis* (Berlese, 1887)

5. Proximal seta of coxa I inflated basally .... *A. tuberans*, new species
Proximal seta of coxa I a slim setiform 6

6. Posterior part of dorsal plate with numerous accessory setae extending anterior to setae J1. Dorsal plate tapering posterior to coxae IV and ending in narrowly rounded apex .... *A. hirsuta*, new species
Posterior part of dorsal plate without, or with a few accessory setae confined to region J2-J5. Dorsal plate broadly rounded posteriorly 7

7. Pilus dentilis very slightly inflated basally. Setae of dorsal plate very delicate and short, particularly in central area .... *A. pachyptilae* (Zumpt and Till, 1956)
Pilus dentilis broadly inflated basally. Setae of dorsal plate relatively coarse .... *A. fahrenholzi* (Berlese, 1911)

Androlaelaps casalis (Berlese)

Iphis casalis Berlese, 1887

Androlaelaps casalis, Till, 1963:23 [syn. list and redescription].

A single female of *A. casalis* was identified ex *Rattus rattus* collected at Santa Rosa, 1 km N and 2 km W Merida, Merida state, Venezuela, 1870 m elev., 24-V-66. This specimen agrees well with the description and figures of Till (1963).

Three collections containing 5 females of somewhat atypical *A. casalis* were recorded from *Saccopteryx bilineata* in Zulia and in T. F. Amazonas, and from *Sturnira lilium* in Barinas. These probably represent accidental host associations or erroneous collection records. The specimens have somewhat longer setae than normal on the dorsal plate and the sternal plate is atypically shallow for *A. casalis*.

Androlaelaps fahrenholzi (Berlese)

Haemolaelaps fahrenholzi Berlese, 1911:432.

Laelaps glasgowi Ewing, 1925:6.

Haemolaelaps glasgowi, Strandtmann, 1949: 343.—Samsinak, 1958:188 [syn. of *H. fahrenholzi*].

Androlaelaps glasgowi, Till, 1963:40 [see syn. list].

A total of 6274 specimens of *A. fahrenholzi* was identified from 1077 infested hosts collected in Venezuela; of these 5523 were females, 389 males and 361 nymphs. The most commonly and heavily infested hosts were *Zygodontomys brevicauda*, *Monodelphis brevicaudata*, *Sigmodon hispidus* and *Oryzomys albigularis*. Less commonly, but heavily infested were *Proechimys semispinosus*, *Heteromys anomalus*, *Sciurus granatensis*, *S. igniventris*, *O. minutus*, *O. concolor*, *Akodon urichi*, *Potos flavus* and *Aotus trivirgatus*. Occasional heavily infested hosts were *Marmosa robinsoni*, *Metachirus nudicaudatus*, *Caluromys philander*, *Rhipidomys macconnelli* and *Cryptotis thomasi*. Occasional hosts usually lightly infested were *M. murina*, *Philander opossum*, *Echimys armatus*, *Sigmomys alstoni*, *Neacomys tenuipes*, *O. bicolor*, *O. minutus*, *O. fulvescens*, *Nectomys squamipes*, *Agouti paca* and *Thomasomys laniger*. Hosts found infested 1 to a few times include *Mesomys hispidus*, *Didelphis azarae*, *M. dryas*, *M. cinerea*, *Bradypus infuscatus*, *R. venustus*, *Cavia porcel-*

lus, Sciurus gilvigularis, Holochilus braziliensis, O. capito, O. macconnelli, Nectomys alfari, Chilomys instans, Rattus norvegicus, Mus musculus, Alouatta seniculus, Cebus nigrivittatus, Lutra annectens, various bats, a hummingbird and an owl.

Collections of the mite were made at elevations ranging from sea level to over 3400 m. The states (or district) in Venezuela from which collections were made are as follows, arranged in order of greatest to least frequency of collection: Monagas, Dto. Federal, Trujillo, T. F. Amazonas, Falcon, Carabobo, Lara, Merida, Aragua, Barinas, Bolivar, Miranda, Sucre, Yaracuy, Guarico, Zulia, Tachira, Apure and Nueva Esparta.

As pointed out by earlier authors notably Tipton et al. (1966), there is a wide range of variation in the species complex designated as *Androlaelaps fahrenholzi.* Essentially the entire range of variation depicted by Tipton et al. (loc. cit.) was encountered in Venezuela with several additional variants as well. Some of the variant forms differ from typical *A. fahrenholzi* by characteristics more striking than many used by Till (1963) in separating species of Ethiopian *Androlaelaps.* These may well prove to represent distinct species, but most of them have been grouped as forms of *A. fahrenholzi* for the present. Among the more striking variant forms are the following: 1) Ex *Metachirus nudicaudatus*, large robust, spiniform mites of the form depicted by Tipton et al. (1966, plates 22, 23); 2) Ex *Potos flavus* and *Aotus trivirgatus*, a form characterized by an apical as well as basal inflation of the pilus dentilis, a relatively long genitoventral plate extending to level of third pair of flanking setae, and with central setae of dorsal plate smaller than normal; 3) Ex *Echimys armatus* and *Mesomys hispidus*, a form which keys out in Till's key (1963) to the *glasgowi-zulu* couplet but fits neither. Setae j5 of the dorsal plate are subequal to distance from j5 to z5 and the genitoventral plate is bordered by 3 pairs of flanking setae; 4) Ex *Cryptotis thomasi*, a small mite with relatively long and narrow genitoventral plate and absence of the dorsal seta pair px2.

Androlaelaps foxi Fonseca

Androlaelaps foxi Fonseca, 1959:180.

A single female of *A. foxi* was identified from *Akodon urichi* collected at Potrerito, Montalban, Carabobo, 1091 m elev., 8-XI-67.

The Venezuelan specimen agrees well in most respects with Fonseca's original description and figures of *A. foxi.* The idiosoma is somewhat narrower in relation to length, 758 μ by 484 μ, than described by Fonseca and the posterolateral setae of the S series on the dorsal plate are somewhat longer than indicated by his illustration. The dorsal plate has 39 pairs setae and appears to have 1 or 2 extra broken setae in the posterior central area. The ventral plates are as figured by Fonseca, but there is an obvious error in the latter's measurement of the length of the genitoventral plate, given as 310 μ from the genital setae to the posterior border. In the Venezuelan specimen, this measurement is 215 μ and the maximum width is 151 μ. Fonseca's measurement of length of the plate probably should read 210 μ, which from his illustration would be correct in comparison with the described width of 155 μ for the plate. Fonseca also erred in stating that leg I is enlarged when obviously he meant to state leg II is enlarged, as he correctly has illustrated. Chaetotaxy of legs I to IV respectively: trochanter - 6, 5, 5, 5; femur - 12, 11, 6, 6; genu - 13, 11, 9, 10; tibia - 13, 10, 8, 10.

Androlaelaps hirsuta, new species

(Fig. 67-72)

DIAGNOSIS

A robust, spiniform mite with hypertrichy of dorsal plate and unarmed integument. Female with coarsely inflated pilus dentilis, rectangular sternal plate and small genitoventral plate. Male with hypertrichy of holoventral plate.

DESCRIPTION

FEMALE: Idiosoma of gravid female broadly ovate, widest behind level of coxae IV and narrow anteriorly; 822 μ long by 606 μ wide. *Dorsum* (Fig. 68). Dorsal plate 710 μ long by 355 μ wide, with sides essentially parallel in area of coxae II to coxae IV thence rapidly narrowing posteriorly to narrowly rounded caudal margin, leaving wide margin of body uncovered; anterior tip of plate fused with peritremalia. Dorsal plate hypertrichous bearing an extra pair setae betwen j4 and z4 and about 12 extra setae in the central opisthosomal region between setae j6 and J5. Dorsal plate setae strong and many with barbs; representative setal lengths: j1 - 43 μ, j5 - 122 μ, J5 - 67 μ, Z5 - 116 μ; distance between trichopores of j5 and z5 - 55 μ. Surface of dorsal plate reticulated and with usual pores; particularly prominent are 2 pairs of submarginal round spots associated with pores near setae S3 and S4. Unarmed portions of dorsal opisthosoma with many setae barbed but somewhat smaller than adjacent setae of dorsal plate, and extending from region of coxae II to posterior with exception of nonsetose area directly posterior to dorsal plate. *Venter* (Fig. 67). Sternal plate rectangular with concave lateral margins and slightly concave posterior margin as figured (Fig. 67); surface strongly reticulated; length at midline 124 μ, width at level of setae II - 156 μ; setae I set on anterior margin, 64 μ long with bases separated by 92 μ; setae III 86 μ long; metasternal setae subequal to first sternal setae. Presternal area strongly reticulate and with pair of pores subtending base of tritosternum. Genitoventral plate small, lingulate, with coarsely reticulate surface, 126 μ long from anterior margin of genital setae trichopores to posterior margin; 112 μ wide at widest point just anterior to first pair of flanking setae; 97 μ wide at level of genital setae; latter are 103 μ long and set on lateral margins of plate. Anal plate narrowly pyriform 128 μ long by 98 μ wide. Adanal setae 58 μ long arising just cephalad of posterior margin of anus and extending just past base of postanal seta; latter 83 μ long. Metapodal platelets small, about twice as long as wide. Unarmed opisthogaster with about 30 pairs of strictly ventral setae including 2 pairs flanking genitoventral plate; setae toward margins barbed; many setae on margins as in Fig. 67. Peritremata extend to mid-level of coxae I, moving from ventral to dorsal side at level between coxae I and II. Peritremalia well developed, extending well posterior to stigmata but not fused with parapodal plates. *Gnathosoma* (Fig. 69 and 70). Digits of chelicerae 45 μ long; movable digit with curved pointed tip and 2 teeth, fixed digit apparently lacking teeth but with large pilus dentilis broadly inflated basally and slightly inflated distally in coarse, setiform, recurved tip. Arthrodial processes at base of movable digit short, setiform, subequal. Deutosternal groove with 6 rows of 3 to 4 denticles each. Inner hypostomal setae 56 μ long extending almost to bases of shorter gnathosomal setae. *Legs.* Coxal setae setiform with slight thickening of posterior seta of coxa III. Leg chaetotaxy normal for genus, tibia III with 8 setae; genu IV with 10 setae. All setae of tarsus II pointed. Length of tarsus IV almost 6 times its width at base.

MALE: Idiosoma narrowly oval with slight shoulders over coxae II; 532 μ long by 317 μ wide. *Dorsum.* Dorsal plate 532 μ long; lateral borders indistinct but appear to extend almost to margins of idiosoma; plate chaetotaxy as in female with possible exception of lateral marginal areas; posterior setae and marginals barbed as in female. *Venter* (Fig. 71). Holoventral plate with 36 setae; plate shape as in *A. fahrenholzi*; anterior pair of setae extend slightly beyond bases of second pair. Adanal setae arising at mid-level of anus, 37 μ long; postanal setae 60 μ long. Peritremata and peritremalia as in female. *Gnathosoma.* Chelicerae (Fig. 72) similar to those of *A. fahrenholzi* with elongate, tubular spermadactyl coiled terminally in ½ to 1½ revolutions and with movable digit a transparent slim lobe about ⅓ length of spermadactyl; reduced fixed digit bearing a small, inflated pilus dentilis; arthrodial processes in form of a row of equal "microsetae" subtending base of movable chela. *Legs.* As described for female.

DEUTONYMPH: Dorsal plate hypertrichous; chaetotaxy as in female. Dorsal margins of body heavily setose. Sternal plate bearing usual 4 pairs setae and a fifth pair just off the posterior margin; anterior pair short, not reaching bases of second pair. Presternal area with strong transverse reticular pattern and appearing continuous with sternal plate. Anal plate as in female. Unarmed opisthogaster with about 22 pairs strictly ventral setae plus many marginal setae. Peritremata as in female.

PROTONYMPH: With 11 pairs setae on podonotal plate and 8 pairs on opisthonotal plate with 6 pairs on unarmed cuticula between the plates. Sternal plate indistinct but with usual 3 pairs setae and 2 pairs pores in medial area between coxae II and III. A fourth pair of minute setae between coxae IV. Anal plate as in female. Four pairs well developed, strictly ventral setae on unarmed opisthogaster. Marginal setae few and barbed. Chelicerae as in female.

TYPE DATA: Female holotype and 4 female paratypes ex *Marmosa fuscata* Thomas (SVP 13950), 1335 m elev., La Laguna, 2 km N and 4 km W Caripe, Monagas, Venezuela, collected 6-VII-67 by the Norman Peterson team. Allotype (SVP 14090) with same data as type except at 1338 m elev., and collected 9-VII-67. Additional paratypes are 5 females ex 2 *M. fuscata* at the same locality as the holotype; 6 females ex 1 *M. fuscata* near San Agustin 2 km N and 4 km W Caripe in Monagas; 3 females ex 3 *M. fuscata* collected 5 km NNE Caracas, Dto. Federal at 2104 to 2124 m elev.; 1 male, 1 female, 3 deutonymphs and 2 protonymphs ex 2 *M. fuscata* at La Copa, 4 km NW Montalban, Carabobo; 1 female and 5 males ex *M. fuscata* at La Copa, Carabobo at 1513 m elev.

Collections of *A. hirsuta* in addition to the type series are as follows: 43 females, 4 males, 4 deutonymphs and 6 protonymphs ex 12 *M. fuscata* in the states of Carabobo, Monagas, Miranda, Tachira and Dto. Fed-

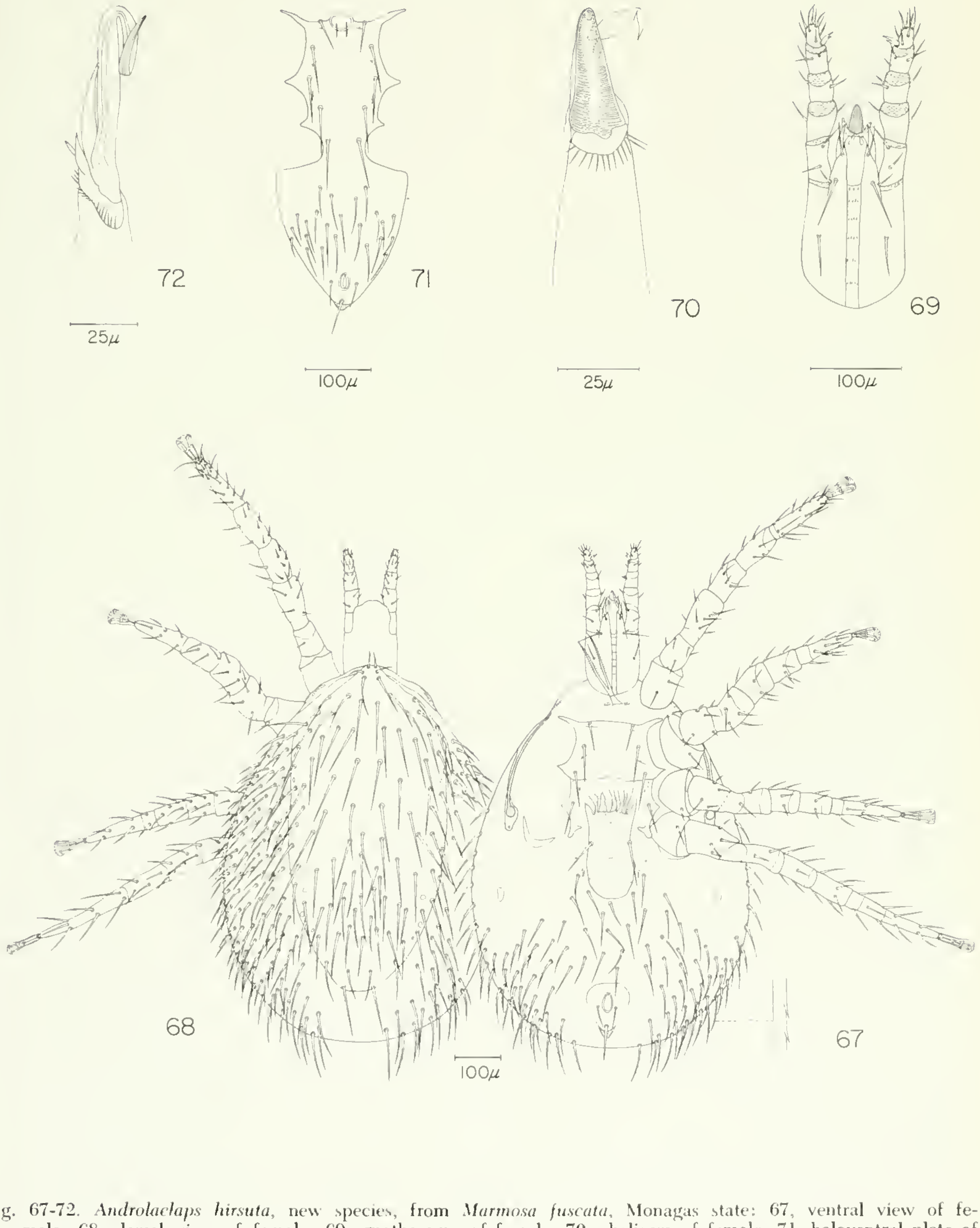

72
25μ
71
100μ
70
25μ
69
100μ
68
100μ
67

Fig. 67-72. *Androlaelaps hirsuta*, new species, from *Marmosa fuscata*, Monagas state: 67, ventral view of female; 68, dorsal view of female; 69, gnathosoma of female; 70, chelicera of female; 71. holoventral plate of male; 72, chelicera of male.

eral at elevations from 1160 to 2405 m; 11 females, 4 deutonymphs and 3 protonymphs ex 2 *M. fuscata* in Carabobo at 1513 m elev.; 1 female ex *Rattus rattus* in Carabobo at 1810 m; 2 females ex 1 *Zygodontomys brevicauda* in Monagas at 18 m; 2 females ex 1 *Proechimys* sp. in Falcon; 1 male ex *Vampyressa pusilla* in Carabobo at 1810 m; 6 females, 2 males and 1 deutonymph ex *Phyllostoma discolor* in Trujillo at 90 m.

Androlaelaps pachyptilae (Zumpt and Till)

Haemolaelaps pachyptilae Zumpt and Till, 1956: 285.

Androlaelaps pachyptilae, Till, 1963:62.

A single collection of 6 females was identified as *A. pachyptilae* ex a "bird" collected at San Agustin, 3 km N and 4 km W Caripe, Monagas, Venezuela, 10-VII-67.

The specimens agree well with Till's 1963 redescription and figures of this species. It is a small species with small, delicate setae in the central area of the dorsal plate, genitoventral plate widest at level of first pair flanking setae and widely separated from anal plate, and pilus dentilis very slightly inflated basally.

Androlaelaps projecta, new species
(Fig. 73-76)

Diagnosis of Female

With general facies of *A. zuluensis* Zumpt, with genitoventral plate extending almost to anal plate. Sternal plate with irregular posterior margin with median projection. Pilus dentilis well developed, prominent, setiform. Ventral stout spines well developed on leg II.

Description

Female: *Dorsum* (Fig. 74). Idiosoma 564 to 607 μ long by 371 to 387 μ wide. Dorsal plate 537 to 592 μ long by 349 to 376 μ wide with sides almost straight at mid-level and covering most of idiosoma; 39 pairs simple setae plus 2 unpaired submedian opisthonotal setae distributed as in Fig. 74; most setae extend to, or almost to, bases of next posterior setae; representative setal lengths: j1 - 34 μ, j5 - 49 μ in paratype, J5 - 43 μ (49 μ in paratype), Z5 - 67 μ (79 μ in paratype). Distance between bases of setae j5 and z5 - 55 μ. Surface of dorsal plate lightly reticulated. *Venter* (Fig. 73). Tritosternum with base 23 μ long, lacinia 75 μ, fused for basal 24 μ. Sternal plate 104 μ long on midline by 113 μ wide at level of setae II; anterior margin slightly concave, lateral margins deeply concave, posterior margin with median projection flanked by pair semicircular concavities and broadly angulate posterolateral corners; with usual 3 pairs of setae and 2 pairs of pores as illustrated; setae I arise on anterior margin, 43 μ long and bases separated by 62 μ; setae III 60 μ long with bases separated by 114 μ. Endopodal plates angulate between coxae III and IV extending in area anteriorly and posteriorly around inner aspects of coxae, appearing fused anteriorly with posterolateral margins of sternal plate. Metasternal setae situated in inner angle of endopodal plates, slightly smaller than third pair sternal setae. Genitoventral plate flask-shaped with truncate caudal margin, extending almost to anal plate, 210 μ long from anterior margins of genital setae trichopores to posterior margin, 161 μ greatest width in region of first to second pair of flanking setae, 116 μ wide at level of genital setae, which are 49 μ long. Anal plate about as long as wide (98 to 100 μ) with adanal setae arising at posterior level of anus and about 43 to 49 μ long; postanal seta 31 μ long in paratype (missing in type). Chaetotaxy of opisthogaster as figured; 2 pairs setae flanking midlateral margins of genitoventral plate and third pair just anterior to posterolateral margins of plate; total of 7 pairs setae on strictly ventral portion of unarmed opisthogaster and 6 pairs on margins. Metapodal platelets irregular, rodlike, about 30 μ long. Peritremata extend to anterior midlevel of coxae I. Peritremalia extending well posterior to stigmata, each with a terminal and a subterminal pore, separate from parapodal platelets of coxae IV. *Gnathosoma*. Tectum capituli membranous, without irregular or setiform projections. Chelicerae (Fig. 76) with fixed digit bearing prominent slender setiform pilus dentilis, but orientation obscures dentition if any; movable digit with 2 teeth and recurved pointed tip. Gnathosomal setae 27 μ long; inner hypostomals 49 μ, slightly longer than distal hypostomals; outer hypostomals very short. Deutosternal groove with 6 rows of 3 to 4 denticles each. Corniculi long, slim, well sclerotized. Labrum-epipharynx elongate, with longitudinal grooves ventrally. Pedipalp (2-5-6-14) with 2 tined apotele. *Legs*. Chaetotaxy of legs I to IV respectively: trochanter - 6, 5, 5, 5; femur - 13, 11, 6, 6; genu - 13, 11, 9, 10; tibia - 13, 10, 8, 10. Leg II (Fig. 75) with seta av1 of femur modified as a stout, blunt spine, slightly curved apically, 28 μ long (34 μ in paratype) by 14 μ wide at base, about ½ or more as long as width of femur at base; seta av1 of genu II modified as a smaller spine; seta av1 of tibia II modified as a pointed spine swollen and angulate basally. Tarsus II with setae av1 to 3 thickened; all tarsal setae pointed.

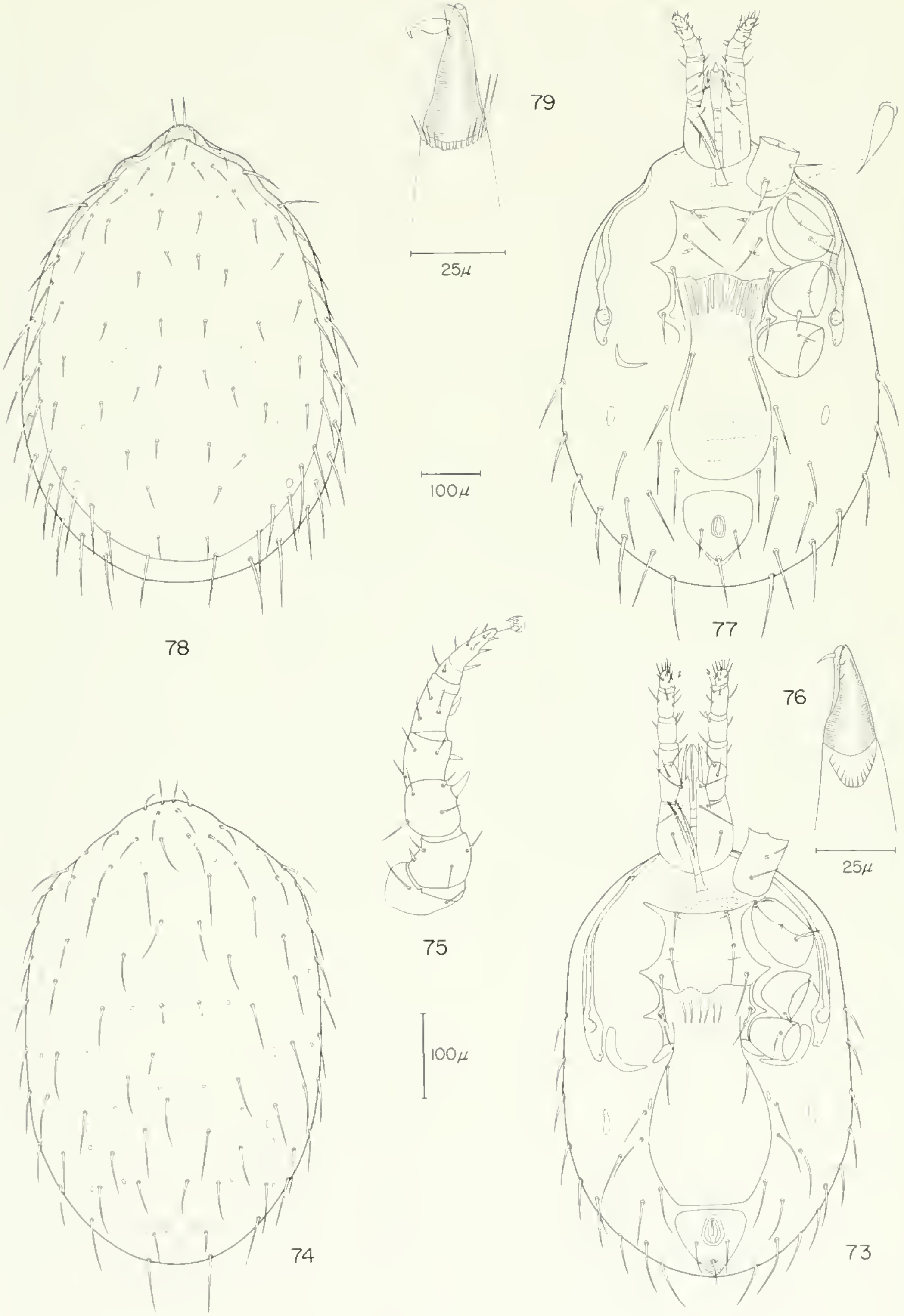


Fig. 73-79. 73-76, *Androlaelaps projecta*, new species, female from *Sciurus granatensis*: 73, ventral view; 74, dorsal plate; 75, ventral view of leg II; 76, chelicera. 77-79, *Androlaelaps tuberans*, new species, female from *Marmosa cinerea*: 77, ventral view; 78, dorsal view of idiosoma; 79, chelicera.

A. projecta is known only from the adult females.

TYPE DATA: Female holotype and 1 female paratype ex *Sciurus granatensis* Humboldt (SVP 34089), La Vega del Río Santo Domingo, 2 km SW Altamira, Barinas, collected 2-I-68. Other female paratypes are: 1 ex *Zygodontomys brevicauda* and 1 ex *Heteromys anomalus* from Hda. Socopito, 20 km S and 98 km E Maracaibo, Falcon; 1 ex "bird" from San Agustin, 3 km N and 4 km W Caripe, Monagas. In addition to the type series, 4 specimens were identified as this species ex an heteropteran, *Blissus* sp. near *insularis* Barber, from Maracaibo, collected by A. Nontial on 20-I-70, and forwarded through the courtesy of Dr. José R. Labrador S. of the Universidad del Zulia.

A. projecta resembles *A. setosus* Fox, 1946, which differs in being a larger mite with much longer dorsal, as well as most of the ventral, setae, and in having a sternal plate with a concave posterior margin; additionally there are 14 or 15 pairs of setae on the unarmed portion of the opisthogaster in *A. setosus*.

A. projecta differs from *A. foxi* Fonseca, 1959 in that the latter has a sternal plate with concave posterior margin, has very short setae on the central portion of the dorsal plate and has a short, fine pilus dentilis on the fixed digit of the chelicera.

A. projecta differs from the closely related *A. zuluensis* Zumpt, 1950 in that the latter has a sternal plate with posterior margin straight to slightly irregular, has a relatively smaller ventral spur on femur II and more numerous setae on the unarmed portion of the opisthogaster.

Androlaelaps rotundus (Fonseca)

Eubrachylaelaps rotundus Fonseca, 1936*a*:20.—1959:163 [redescribed and figured].—Furman and Tipton, 1961:171 [Venezuelan records].

A total of 769 female and 3 male specimens of *A. rotundus* was identified from 95 infested hosts collected in Venezuela. From 70 specimens of the common host, *Akodon urichi*, were taken 716 females and 3 males. Occasional hosts found positive 2 to 6 times were *Oryzomys albigularis*, *O. concolor*, *O. minutus* and *Heteromys anomalus*. Single collections of 1 to 16 mites were taken from *Monodelphis brevicaudata*, *Cavia porcellus*, *Zygodontomys brevicauda*, *Sigmodon hispidus*, *Rattus norvegicus*, *R. rattus*, "bird" and several species of bats.

Hosts infested with *A. rotundus* were taken at elevations ranging from 90 to 3260 m, with the majority collected above 1000 m. States (or district) in Venezuela from which collections were made are as follows, arranged in order of greatest to least frequency: Dto. Federal, Aragua, Carabobo, T. F. Amazonas, Falcon, Monagas, Merida, Sucre, Guarico, Miranda, Tachira, Trujillo.

Specimens studied from Venezuela fall within the range of variations reported by Fonseca (1959).

Androlaelaps tuberans, new species

(Fig. 77-79)

DIAGNOSIS OF FEMALE

Of medium size for genus, with proximal seta of coxa I inflated basally, with large genitoventral plate flanked by 3 pairs setae, with short, delicate central setae on dorsal plate and with pilus dentilis broadly inflated basally and narrowly inflated distally.

DESCRIPTION

FEMALE: Idiosoma of gravid female broadly ovate, somewhat narrowed anteriorly, with slight shoulders over coxae I and coxae II; 768 μ long by 531 μ wide. *Dorsum* (Fig. 78). Dorsal plate reticulate with anterolateral margins strongly sclerotized, 720 μ long by greatest width of 478 μ just behind level of coxae IV, leaving narrow lateral margins of idiosoma exposed posterior to coxae II; exposed margins broader posteriorly. Dorsal plate with 39 pairs setae; all but marginal setae very short and delicate. Representative setal lengths: j1 - 43 μ, j5 - 23 μ, J5 - 32 μ, Z5 - 98 μ. Distance between bases of setae j5 and z5 - 54 μ. Marginal setae of dorsal plate and idiosoma barbed. Unarmed dorsal margin with single row of strong, minutely barbed setae. *Venter* (Fig. 77). Sternal plate subrectangular, reticulate, 107 μ long on midline by 153 μ wide at level of second pair setae; setae I 60 μ long extending almost to level of second pair of pores and with bases separated by 92 μ; setae III 85 μ long and with bases separated by 161 μ; metasternal setae relatively small, 43 μ long. Genitoventral plate large, flask shaped, with broadly rounded caudal margin; 193 μ long from level of genital setae bases to posterior margin, flanked by 3 pairs of setae and almost touching anal plate; width at level of genital setae 116 μ; maximum width between first and second flanking setae 160 μ. Genital setae 86 μ long. Anal plate slightly longer than broad, 128 μ long and 122 μ wide; broadest anteriorly, with anus placed 40 μ behind slightly convex plate margin; adanal setae at level of posterior margin of anus, 55 μ long, extending to base of postanal seta; latter 77 μ long. Unarmed opisthogaster with 9 to 10 pairs ventral setae and a few strong, minutely barbed marginal setae. Metapodal platelets irregularly oval, about 30 by 17 μ. Peritremata extend to level of anterior ⅓ of coxae I proceeding from ventral to dorsal side over coxae II. Peritremalia extending normally behind stigmata and widely separate from parapodal plates. *Gnathosoma.* Chelae 40 μ long, movable chela with curved, pointed tip and with 2 teeth, but orientation prevents exact description. Pilus dentilis of fixed digit large, broadly inflated basally, sharply constricted at apical ⅓ with distal ⅓ a coarse, slightly inflated sickle (Fig. 79). Setiform arthrodial processes at base of movable digit varying from short to almost ½ length of movable digit. Deutosternal groove with 6 rows of 3 to 6 denticles each. Inner hypostomal setae 49 μ long reaching to base of gnathosomal setae and longer than the latter; gnathosomal and hypostomal setae all delicate, setiform. *Legs.* Coxa I with proximal seta inflated basally, acuminate, 43 μ long by 8 μ wide; distal seta slim, setiform, 50 μ long; posterior seta of coxa III spiniform; other coxal setae setiform. Leg chaetotaxy normal; tibia III with 8 setae; genu IV with 10 setae. Tarsus IV 5 times longer than width at base. Tarsus II with some setae rather spiniform, but all are sharply pointed.

Androlaelaps tuberans is known only from the females.

Type Data: Holotype and 1 paratype ex *Marmosa cinerea* (Temminck) (SVP 15761), Belén, Río Cunucunuma, T. F. Amazonas, Venezuela, 150 m elev., 17-I-67, collected by the Tuttle team. Four additional paratypes have the same host and locality data as the type but were collected 12-II-67. Six paratypes were taken from 2 *M. cinerea* and 2 paratypes from *Proechimys* sp., 130 m elev., Capibara, Casiquiare Canal, T. F. Amazonas, 29 and 31-V-67, collected by the Tuttle team.

LITERATURE CITED

Baker, E. W., and G. W. Wharton. 1952. An introduction to acarology. Macmillan Co., New York. 465 p.

Barrera, I. Bassols de. 1970. Nuevos datos sobre *Gigantolaelaps* Fonseca 1939 (Acarina: Dermanyssidae: Laelapinae). Anales de la Escuela Nacional de Ciencias Biologicas 17:55-63.

Berlese, A. 1887. Acari, Myriopoda et Scorpiones hucusque in Italia reperta. Ordo Mesostigmata (Gamasidae). Patavii, fasicle 39, number 1.

———. 1903. Diagnosi di alcune nuove specie di Acari italiani, mirmecofili e liberi. Zoologischer Anzeiger 27:12-28.

———. 1911. Acarorum species novae quindecim. Redia 7:429-435.

Evans, G. O., and W. M. Till. 1965*a*. A New Laelapine Mite from the Golden Mole. *Chrysochloris stuhlmanni* Matschie. The Annals and Magazine of Natural History, Series 13. 8:629-634.

———. 1965*b*. Studies on the British Dermanyssidae (Acari: Mesostigmata). Part I. External Morphology. Bulletin of the British Museum (Natural History), Zoology 13:249-294.

———. 1966. Studies on the British Dermanyssidae (Acari: Mesostigmata). Part II. Classification. Bulletin of the British Museum (Natural History), Zoology 14:109-370.

Ewing, H. E. 1924. Ectoparasites of Some Polynesian and Malaysian Rats of the Genus *Rattus*. Bulletin of the Bernice P. Bishop Museum, Honolulu. 14:1-11.

Ewing, H. E. 1925. New Parasitic Mites of the Genus *Laelaps*. Proceedings of the Entomological Society of Washington 27:1-7.

———. 1933. New Genera and Species of Parasitic Mites of the Superfamily Parasitoidea. Proceedings of the United States National Museum 82:1-14. Plates 1-4.

Fonseca, F. da. 1936*a*. Notas de Acareologia 18. Novos generos e especies de acarianos parasitas de ratos (Acari: Laelaptidae). Memorias do Instituto de Butantan 10:17-23.

———. 1936*b*. Notas de Acareologia 19. Generos e especies novas de acarianos parasitas de mammiferos (Acari: Laelaptidae). Memorias do Instituto de Butantan 10:25-32.

———. 1936*c*. Notas de Acareologia 20. Especies novas de acarianos do genero *Laelaps* parasitas de ratos do Brasil. Memorias do Instituto de Butantan 10:33-37.

———. 1937. (Dated 1935-36 but distributed May, 1937) Notas de Acareologia 24. A. Representante brasileiro do genero *Dermanyssus* Duges, 1834 (Acari: Dermanyssidae). B. Nota sobre o nome generico *Paralaelaps*. Memorias do Instituto de Butantan 10:51-59.

———. 1939*a*. Notas de Acareologia 25. Os Laelaptidae gigantes, parasitas de roedores sul-americanos; genero e especies novos (Acari). Memorias do Instituto de Butantan 12:7-102. Figures 1-30.

———. 1939*b*. Notas de Acareologia 26. Novos estudos sobre o genero *Laelaps* Koch, 1836 (Acari: Laelaptidae). Memorias do Instituto de Butantan 12:103-145. Figures 1-9.

Fonseca, F. da. 1959. (Dated 1958 but distributed May 5, 1959) Notas de Acarologia 44. Inquérito sôbre a fauna acarológica de parasitas no nordeste do Brasil. Memorias do Instituto de Butantan 28:99-186.

———. 1960*a*. (Dated 1959 but distributed December 28, 1960) Notas de acarologia 46. Acarofauna Zooparasita na Bolivia. Memorias do Instituto de Butantan 29:89-141.

———. 1960*b*. Notes d'acarologie 45. Enquête acarologique au Pérou. Acarologia 2:1-34.

Fox, I. 1946. Three New Mites from Rats in Puerto Rico. Proceedings of the Biological Society of Washington 59:173-175.

———. 1947. Notes on Ectoparasites from Venezuela (Siphonaptera and Acarina). Zoologica 32:117-119.

Furman, D. P. 1955. *Steptolaelaps* (Acarina: Laelaptidae) A New Genus of Mites Parasitic on Neotropical Rodents. The Journal of Parasitology 41: 519-525.

———. 1971*a*. Observations on Some Laelapid and Macronyssid Mites in the Fonseca Collection (Acari: Mesostigmata). Papeis Avulsos de Zoologia. São Paulo 25(9):69-88.

———. 1971*b*. New Species of *Gigantolaelaps* (Acarina: Laelapidae) from Venezuela. Journal of Medical Entomology 8:707-712.

———. 1972. New Species of *Laelaps* (Acarina: Laelapidae) from Venezuela. Journal of Medical Entomology 9:35-46.

Furman, D. P., and V. J. Tipton. 1958. *Tur uniscutatus* (Turk) 1946 (Acarina: Laelaptidae) from Neotropical Rodents. The Journal of Parasitology 44: 541-547.

Furman, D. P., and V. J. Tipton. 1961. Acaros parasitos laelaptine (Acarina: Laelaptidae) de Venezuela. Memoria de la Sociedad de Ciencias Naturales La Salle 21(60):166-212.

Garrett, L. E., and R. W. Strandtmann. 1967. *Tur breviperitremus* n.sp., a New Laelapine Mite from South Africa. Journal of Medical Entomology 4:240-246.

Herrin, C. S. 1970. A Systematic Revision of the Genus *Hirstionyssus* (Acari: Mesostigmata) of the Nearctic Region. Journal of Medical Entomology 7:391-437.

Hirst, S. 1914. Report on the Arachnida and Myriapoda Collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea. Transactions of the Zoological Society, London 20 (10):325-334.

———. 1915. On Some New Acarine Parasites of Rats. Bulletin of Entomological Research 6:183-190.

Jameson, E. W. 1950. Notes on Mites of the Genus *Neoichoronyssus*, with the Description of a New Subgenus and Three New Species of the Subgenus *Hirstionyssus* (Acarina, Laelaptidae, Macronyssinae). Proceedings of the Entomological Society of Washington 52:161-172.

Koch, C. L. 1836. Deutschlands Crustaceen, Myriapoden und Arachniden, Heft 4:13-20. Herausgegeben von Herrich-Schaffer 40 parts. Regensburg.

Lee, D. 1966. The Neotropical Mite Genus *Gigantolaelaps* Fonseca, 1939. M.S. Thesis, Texas Technological College, Lubbock 1-110.

Lee, D., and D. P. Furman. 1970. *Gigantolaelaps trapidoi*, A New Neotropical Mite (Acarina: *Laelapidae*). Journal of Medical Entomology 7:497-499.

Lee, D., and R. W. Strandtmann. 1967. Two New Species of *Gigantolaelaps* (*Acarina*: Laelaptidae) with a Key to the Females. Journal of the Kansas Entomological Society 40(1):25-32.

Lindquist, E. E., and G. O. Evans. 1965. Taxonomic Concepts in the Ascidae, with a Modified Setal Nomenclature for the Idiosoma of the Gamasina (Acarina: Mesostigmata). Memoirs of the Entomological Society of Canada 47:64 p.

Lizaso, N. M. 1968. Contribuicão ao conhecimento dos Laelaptidae do Brasil (Acarina) II. Papéis Avulsos de Zoologia São Paulo 21:251-257.

Morlan, H. B. 1951. Notes on the Genus *Gigantolaelaps* and Description of a New Species, *Gigantolaelaps cricetidarum* (Acarina: Laelaptidae). The Journal of Parasitology 37:273-279.

Oudemans, A. C. 1904. *Laelaps versteegii*, A New Species of Parasitic Mite. Notes from the Leyden Museum 24:223-231.

Oudemans, A. C. 1910. Nouvelle espèce d'acarien du Chili. Revista Chilena de Historia Natural 14: 147-151.

Pratt, H. D., and J. E. Lane. 1953. *Laelaps oryzomydis*, n. sp., with a Key to Some American Species of *Laelaps* (Acarina: Laelaptidae). Journal of the Washington Academy of Science 43:358-360.

Samsinak, K. 1958. Die Milben der Sonnenblumenkerne. Ceskoslovenska Parasitologie 5:185-198.

Strandtmann, R. W. 1949. The Blood-sucking Mites of the Genus *Haemolaelaps* (Acarina: Laelaptidae) in the United States. The Journal of Parasitology 35:325-352.

Strandtmann, R. W., and C. J. Mitchell. 1963. The Laelaptine Mites of the *Echinolaelaps* Complex from the Southwest Pacific Area (Acarina: Mesostigmata). Pacific Insects 5:541-576.

Till, W. M. 1963. Ethiopian Mites of the Genus *Androlaelaps* Berlese s. lat. (Acari: Mesostigmata). Bulletin of the British Museum (Natural History), Zoology 10(1):1-104.

Tipton, V. J. 1960. The Genus *Laelaps* with a Review of the Laelaptinae and a New Subfamily Alphalaelaptinae (Acarina: Laelaptidae). University of California Publications in Entomology 16(6):233-356.

Tipton, V. J., R. M. Altman, and C. M. Keenan. 1966. Mites of the Subfamily Laelaptinae in Panama (Acarina: Laelaptidae). In Ectoparasites of Panama, edited by Wenzel, R. L., and V. J. Tipton. Field Museum of Natural History, Chicago, 23-82.

Turk, F. A. 1946. A New Genus and Two New Species of Mites Parasitic on Muridae. Annals and Magazine of Natural History, (11)13:347-354.

———. 1950. Studies of Acari. —VI. Parasitic Mites from Mammalian Hosts Obtained in Ceylon. Parasitology 40:63-76.

Zumpt, F. 1950. Notes on Parasitic Mites. I. Some Remarks on the Family Laelaptidae (*sensu* Vitzhum 1943) with Descriptions of Three New Species from African Rodents. Parasitology 40:298-303.

Zumpt, F., and W. M. Till. 1956. Notes on *Haemolaelaps glasgowi* (Ewing) and Related Forms in the Ethiopian Region, with Descriptions of Four New Species (Acarina: Laelaptidae). Zeitschrift fur Parasitenkunde 17:282-291.

S-NA-P(rovo)

Brigham Young University
Science Bulletin

MUS. COMP. ZOOL.
LIBRARY
FEB 17 1973
HARVARD
UNIVERSITY

THE TICKS OF VENEZUELA (ACARINA: IXODOIDEA) WITH A KEY TO THE SPECIES OF AMBLYOMMA IN THE WESTERN HEMISPHERE

by

Eleanor K. Jones, Carleton M. Clifford,
James E. Keirans, and Glen M. Kohls

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 4

SEPTEMBER 1972

BRIGHAM YOUNG UNIVERSITY SCIENCE BULLETIN
BIOLOGICAL SERIES

Editor: Stanley L. Welsh, Department of Botany,
Brigham Young University, Provo, Utah

Members of the Editorial Board:

Vernon J. Tipton, Zoology
Ferron L. Andersen, Zoology
Joseph R. Murdock, Botany
Wilmer W. Tanner, Zoology

Ex officio Members:
A. Lester Allen, Dean, College of Biological and Agricultural Sciences
Ernest L. Olson, Chairman, University Publications

The Brigham Young University Science Bulletin, Biological Series, publishes acceptable papers, particularly large manuscripts, on all phases of biology.

Separate numbers and back volumes can be purchased from Publication Sales, Brigham Young University, Provo, Utah. All remittances should be made payable to Brigham Young University.

Orders and materials for library exchange should be directed to the Division of Gifts and Exchange, Brigham Young University Library, Provo, Utah 84601.

Brigham Young University
Science Bulletin

THE TICKS OF VENEZUELA (ACARINA: IXODOIDEA) WITH A KEY TO THE SPECIES OF AMBLYOMMA IN THE WESTERN HEMISPHERE

by

Eleanor K. Jones, Carleton M. Clifford,
James E. Keirans, and Glen M. Kohls

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 4

SEPTEMBER 1972

TABLE OF CONTENTS

- ABSTRACT 1
- INTRODUCTION 1
- COLLECTING LOCALITIES 1
- SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTION 3
- Family Argasidae 3
  - Genus *Antricola* Cooley and Kohls, 1942 4
    - *Antricola* (*Antricola*) *silvai* Cěrný, 1967 4
  - Genus *Argas* Latreille, 1795 4
    - *Argas* (*Persicargas*) miniatus Koch, 1844 4
  - Genus *Ornithodoros* Koch, 1844 4
    - *Ornithodoros* (*Alectorobius*) *azteci* Matheson, 1935 4
    - *Ornithodoros* (*Alectorobius*) *boliviensis* Kohls and Clifford, 1964 5
    - *Ornithodoros* (*Alectorobius*) *brodyi* Matheson, 1935 5
    - *Ornithodoros* (*Alectorobius*) *echimys* Kohls, Clifford, and Jones, 1969 6
    - *Ornithodoros* (*Alectorobius*) *eptesicus* Kohls, Clifford, and Jones, 1969 6
    - *Ornithodoros* (*Alectorobius*) *hasei* (Schulze, 1935) 6
    - *Ornithodoros* (*Alectorobius*) *marmosae* Jones and Clifford, 1972 7
    - *Ornithodoros* (*Alectorobius*) *puertoricensis* Fox, 1947 8
    - *Ornithodoros* (*Alectorobius*) *rossi* Kohls, Sonenshine, and Clifford, 1965 9
    - *Ornithodoros* (*Alectorobius*) *setosus* Kohls, Clifford, and Jones, 1969 9
    - *Ornithodoros* (*Alectorobius*) *stageri* Cooley and Kohls, 1941 9
    - *Ornithodoros* (*Alectorobius*) *talaje* (Guérin-Méneville, 1849) 9
    - *Ornithodoros* (*Alectorobius*) *tiptoni* Jones and Clifford, 1972 9
    - *Ornithodoros* (*Alectorobius*) *tuttlei* Jones and Clifford, 1972 10
    - *Ornithodoros* (*Alectorobius*) *yumatensis* Cooley and Kohls, 1941 10
    - *Ornithodoros* (*Subparmatus*) *marinkellei* Kohls, Clifford, and Jones, 1969 10
    - *Ornithodoros* (*Subparmatus*) *viguerasi* Cooley and Kohls, 1941 10
    - *Ornithodoros rudis* Karsch, 1880 10
  - Genus *Otobius* Banks, 1912 11
    - *Otobius megnini* (Dugés, 1884) 11
- Family Ixodidae 11
  - Genus *Amblyomma* Koch, 1884 11
  - Key to the *Amblyomma* of the Western Hemisphere, Males 11
  - Key to the *Amblyomma* of the Western Hemisphere, Females 15
    - *Amblyomma auricularium* (Conil, 1884) 18
    - *Amblyomma beaurepairei* Vogelsang and Santos Dias, 1953 18
    - *Amblyomma cajennense* (Fabricus, 1787) 19
    - *Amblyomma calcaratum* Neumann, 1899 20
    - *Amblyomma coelebs* Neumann, 1899 20
    - *Amblyomma cooperi* Nuttall and Warburton, 1908 20
    - *Amblyomma crassum* Robinson, 1926 21
    - *Amblyomma dissimile* Koch, 1884 21
    - *Amblyomma extraoculatum* Neumann, 1899 21
    - *Amblyomma guianense* Neumann, 1907 22
    - *Amblyomma incisum* Neumann, 1906 22
    - *Amblyomma longirostre* (Koch, 1844) 22
    - *Amblyomma maculatum* Koch, 1844 22
    - *Amblyomma multipunctum* Neumann, 1899 23
    - *Amblyomma naponense* (Packard, 1869) 23
    - *Amblyomma nodosum* Neumann, 1899 23
    - *Amblyomma oblongoguttatum* Koch, 1844 23
    - *Amblyomma ovale* Koch, 1844 24
    - *Amblyomma pacae* Aragão, 1911 25
    - *Amblyomma parvum* Aragão, 1908 25

Amblyomma rotundatum Koch, 1844 25
Amblyomma scalpturatum Neumann, 1966 25
Amblyomma scutatum Neumann, 1899 26
Amblyomma tigrinum Koch, 1844 26
Amblyomma varium Koch, 1844 26
Genus *Anocentor* Schulze, 1937 27
Anocentor nitens (Neumann, 1897) 27
Genus *Boophilus* Curtice, 1891 28
Boophilus microplus (Canestrini, 1887) 28
Genus *Haemaphysalis* Koch, 1844 28
Haemaphysalis juxtakochi Cooley, 1946 28
Haemaphysalis leporispalustris (Packard, 1889) 29
Genus *Ixodes* Latreille, 1795 29
Ixodes (*Exopalpiger*) *jonesae* Kohls, Sonenshine, and Clifford, 1969 30
Ixodes (*Ixodes*) *lasallei* Mendez Arocha and Ortiz, 1958 30
Ixodes loricatus Neumann, 1899 30
Ixodes luciae Senevet, 1940 30
Ixodes (*Ixodes*) *venezuelensis* Kohls, 1953 31
Genus *Rhipicephalus* Koch, 1844 32
Rhipicephalus sanguineus (Latreille, 1806) 32
HOST-PARASITE LIST 33
LITERATURE CITED 38

TICKS OF VENEZUELA (ACARINA: IXODOIDEA) WITH A KEY TO THE SPECIES OF *AMBLYOMMA* IN THE WESTERN HEMISPHERE

by

Eleanor K. Jones,[1] Carleton M. Clifford,[1] James E. Keirans,[1] and Glen M. Kohls[1]

ABSTRACT

Forty-nine species in 2 families and 10 genera are recorded for Venezuela. A key to the species of *Amblyomma* in the Western Hemisphere is given. Host and locality records are provided for each species. No new species are reported but the following 17 species are new for the fauna of Venezuela: *Antricola silvai* Cerný, 1967, *Ornithodoros boliviensis* Kohls and Clifford, 1964, *O. brodyi* Matheson, 1935, *O. puertoricensis* Fox, 1947, *O. rossi* Kohls, Sonenshine and Clifford, 1965, *O. stageri* Cooley and Kohls, 1941, *O. yumatensis* Cooley and Kohls, 1941, *O. marinkellei* Kohls and Clifford, 1969, *O. viguerasi* Cooley and Kohls, 1941, *Amblyomma extraoculatum* Neumann, 1899, *A. incisum* Neumann, 1906, *A. naponense* (Packard, 1869), *A. oblongoguttatum* Koch, 1844, *A. pacae* Aragão, 1911, *A. scalpturatum* Neumann, 1906, *A. tigrinum* Koch, 1844, *Ixodes auritulus* group.

INTRODUCTION

Ticks are vectors and reservoirs for a wide variety of organisms that are infective for wild and domestic vertebrate animals. Many of these pathogens are transmitted to humans when the ticks bite.

In addition to the transmission of pathogens, ticks can also cause toxemia, paralysis, anemia, and severe irritation to man and animals.

The first step in assessing the potential of ticks to cause problems for man and domestic animals is an accurate survey of the species that occur in a given region. This study is intended to provide background information on host-ectoparasite relations for any future epidemiological studies that may be undertaken in Venezuela.

Detailed information on ticks occurring in Venezuela is not currently available, although a number of workers have contributed to the knowledge of ticks in this region (Neumann, 1899, 1901, 1906, 1911; Nuttall, et al., 1908; Brumpt, 1921; Robinson, 1926; Pinto, 1930; Vogelsang, 1936; Aragão, 1936; Vogelsang and Cordero, 1940; Matheson, 1941; Vogelsang and Santos Dias, 1953*a* and *b*; and Diaz-Ungria, 1957). Among these papers the work of Vogelsang and Santos Dias (*loc. cit.*) furnish the only comprehensive study of the ticks in this country. They recorded thirty species in two families and nine genera.

COLLECTING LOCALITIES

The present work is based on extensive collections made during a three-year period (1965-1968) at 82 major collecting localities (Map 1, Table 1) in all parts of Venezuela. This project was part of a larger study entitled *Ecology and Distribution of Mammalian Ectoparasites and Their Hosts in Venezuela* and was supported by the U.S. Army Medical Research and Development Command, Washington, D.C. (Contract No. DA-49-193-MD-2788), under the direction of Drs. Vernon J. Tipton and Charles O. Handley, Jr. About 40,000 mammals were examined

---

[1] U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, National Institute of Allergy and Infectious Diseases, Rocky Mountain Laboratory, Hamilton, Montana 59840

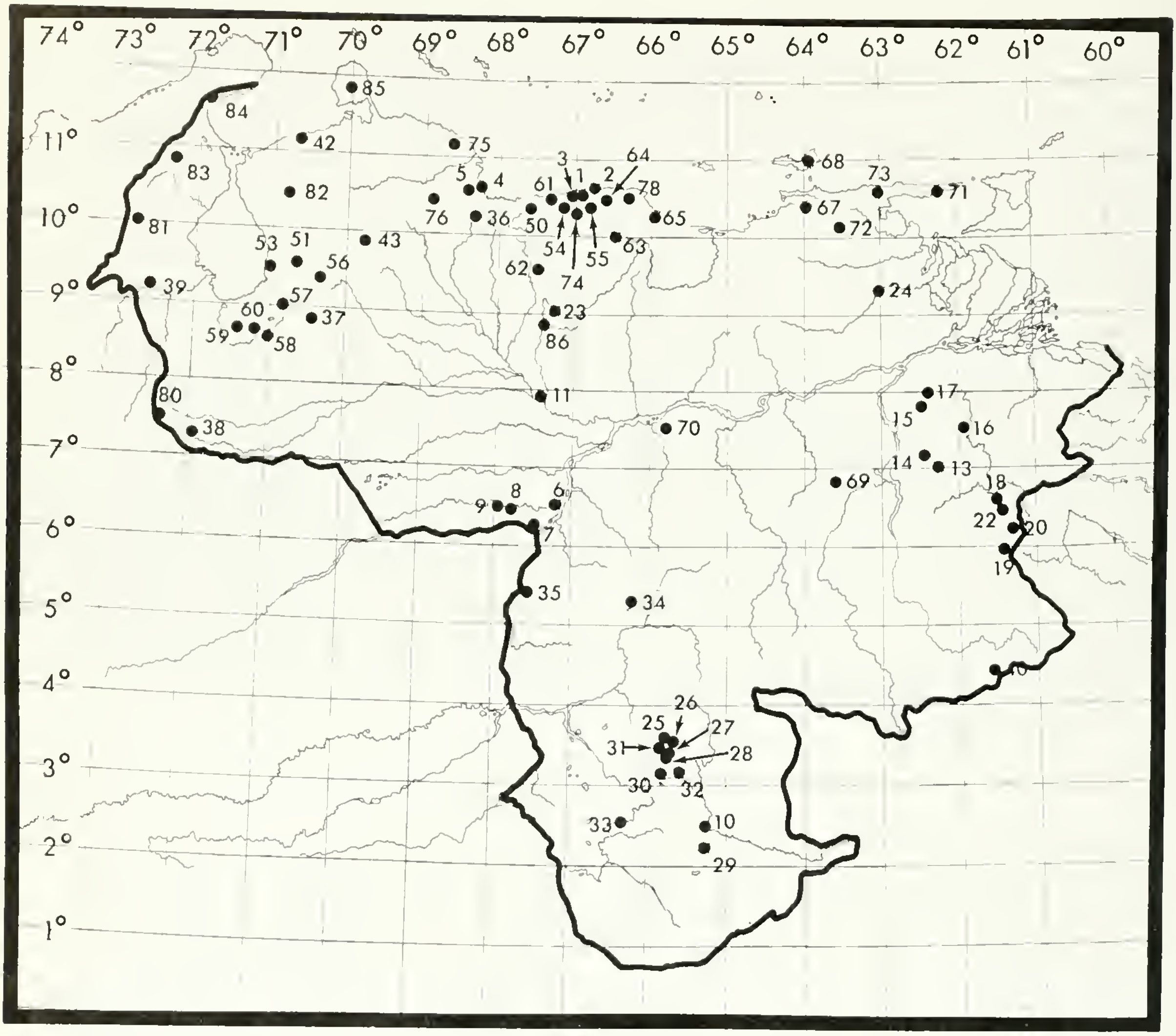

74°
73°
72°
71°
70°
69°
68°
67°
66°
65°
64°
63°
62°
61°
60°
11°
10°
9°
8°
7°
6°
5°
4°
3°
2°
1°
85
84
42
75
64
68
83
3
1
2
78
73
71
5
4
61
82
67
10
76
36
50
65
72
81
53
51
43
54
55
63
56
62
74
39
57
24
60
37
23
59
58
86
80
11
17
15
16
38
70
14
13
69
8
6
9
18
22
20
7
19
35
34
26
25
27
31
28
30
32
33
10
29

Fig. 1. Map of Venezuela showing major collecting localities.

from which over 25,000 vials of ectoparasites were collected. Among these collections was a tremendous volume of ticks which has furnished the basis for this work.

A total of 49 species in 2 families and 10 genera occur in Venezuela. This includes 17 species which are here recorded for the first time.

Table 1. Collecting localities Figured on Map, Fig. 1.

01	Dto. Federal—Los Venados, 4 km NNW Caracas
02	Dto. Federal, Miranda—Pico Ávila (=Hotel Humboldt), 5 km NNE and 6 km NNW Caracas
03	Dto. Federal—Lower Boca Tigre Valley, 5 km NW Caracas
04	Falcón—Boca de Yaracuy, 28 km WNW Pto. Cabello
05	Falcón, Yaracuy, Carabobo—2.5 to 24 km NW, N, and NE Urama
06	Apure—Hato Cariben, Río Cinaruco, 32 to 46 km NE Pto. Paez
07	Apure—Pto. Paez to Río Cinaruco, 38 km NNW Pto. Paez
08	Apure—Río Cinaruco, 48 km NW Pto. Paez
09	Apure—Río Cinaruco, 65 km NW Pto. Paez
10	Amazonas—Boca Mavaca, 84 km SSE Esmeralda
11	Apure—San Fernando de Apure
13	Bolívar—Río Supamo, 50 km SE El Manteco
14	Bolívar—Los Patos, 25 km SE El Manteco
15	Bolívar—25 km S Upata
16	Bolívar—5 km NNW Guasipati
17	Bolívar—5 km S Upata
18	Bolívar—Río Cuyuni, 15 km SE El Dorado
19	Bolívar—Km 125, 85 km SSE El Dorado

20 Bolívar—Km 74 (=El Manaco), 59 km SE El Dorado
21 Bolívar—Km 67 (same as sublocality 20-07)
22 Bolívar—Km 33, 28 km SE El Dorado
23 Guárico—Hato Los Leones, Caño Agua Fría, 23 km NE Calabozo
24 Monagas—Hato Mata de Bejuco and vicinity, 55 km SE Maturín
25 Amazonas—Belén, Río Cunucunuma, 56 km NNW Esmeralda
26 Amazonas—Cerro Duida, Caño Culebra, 50 km NNW Esmeralda, 6 km SE Belén
27 Amazonas—Cerro Duida, Cabecera del Caño Culebra, 40 km NNW Esmeralda
28 Amazonas—Cerro Duida, Cabecera del Caño Negro, 32 km NW Esmeralda
29 Amazonas—Río Mavaca, 108 km SSE Esmeralda
30 Amazonas—Tamatama, 2 km up Río Orinoco from mouth of Caño Casiquiare
31 Amazonas—Acanana, Río Cunucunuma
32 Amazonas—Esmeralda, Río Orinoco
33 Amazonas—Capibara, Caño Casiquiare
34 Amazonas—San Juan, Río Manapiare
35 Amazonas—Pto. Ayacucho to 65 km SSW Pto. Ayacucho
36 Carabobo—Montalbán
37 Barinas—Altamira
38 Apure—Nulita, 3 km N San Camilo (= El Nula), Selvas de San Camilo
39 Zulia—El Rosario, 39 to 65 km WNW Encontrados
40 Bolívar—Icabarú to 56 km NE Icabarú
41 Monagas—Hato Mata de Bejuco and vicinity (same as locality 24)
42 Falcón—Capatárida
43 Lara—Caserio Boro, 10 to 40 km N and NE El Tocuyo
44 Carabobo—Montalbán (same as locality 36)
50 Aragua—Rancho Grande Biological Station, 12 km N Maracay
51 Trujillo—various localities 10 to 30 km N, NW and WNW Valera
53 Trujillo—Hda. Valle Verde, 46 to 54 km WNW Valera
54 Dto. Federal—Alto Não León, 29 km SW Caracas, near Petaguire
55 Miranda—11 to 24 km SE Caracas
56 Trujillo—Hda. Misisí, 14 km E Trujillo
57 Mérida—Paramito, 3 km W Timotes
58 Mérida—Near Tabay, 13 km NE and E Mérida
59 Mérida—La Carbonera, 24 km W Mérida
60 Mérida—Santa Rosa, 1 km N Mérida
61 Dto. Federal—Hda. Carapiche, near El Limón, 46 km W Caracas
62 Guárico—Hato Las Palmitas, 35 km SSW San Juan de los Morros
63 Guárico, Miranda—10 to 21 km NE, N, and NW Altagracia, near Guatopo Park
64 Miranda—Curupao, 30 km E Caracas
65 Miranda—Río Chico
66 Amazonas—Esmeralda (same as locality 32)
67 Sucre—2 to 24 km E Cumaná
68 Nueva Esparta—Isla Margarita
69 Bolívar—Hato San José, 125 to 150 km S Ciudad Bolívar
70 Bolívar—Hato La Florida, 45 km ESE Caicara
71 Sucre—Ensenada Cauranta, 7 to 12 km NE Güiria
72 Monagas, Sucre—San Agustín, 2 to 8 km NW Caripe
73 Sucre—Manacal, 26 km ESE Carúpano
74 Miranda—IVIC, 15 km SW Caracas
75 Falcón—Near Mirimire
76 Yaracuy—Minas de Aroa, 20 km NW San Felipe
77 Miranda—12 to 24 km SE Caracas (same as locality 55)
78 Miranda—Caves near Virongo, 69 km E Caracas
80 Táchira—Buena Vista, 40 km SW San Cristóbal
81 Zulia—Kasmera, 20 km WSW Machiques
82 Falcón—Cerro Socopo, 92 km ESE Maracaibo
83 Zulia—Near Cerro Azul, 72 km WNW Maracaibo
84 Zulia—Near Cojoro, 111 km NNW Maracaibo
85 Falcón—Peninsula de Paraguaná, 57 km NW Coro
86 Guárico—Biological Station, 11 km SSE Calabozo

SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTION

Family Argasidae

Four genera of Argasidae are reported from Venezuela. Two of these, *Argas* and *Otobius*, are based only on literature references as indicated below.

A key to adults and nymphs of the genera and most of the species of Argasidae in Venezuela is given by Cooley and Kohls, 1944.

Genus *Antricola* Cooley and Kohls, 1942

Only one species of this genus is found in Venezuela.

Antricola (*Antricola*) *silvai* Černý, 1967

Antricola silvai Černý, 1967:141.

Material Examined

Falcon: 20+ LL from 5 *Pteronotus davyi*, 58 km N, 34 km W Coro, Cueva del Guano, 120 m elev., 10-23.VII.68, N. E. Peterson, J. Matson; 2LL from 2 *Mormoops megalophylla* 58 km N, 34 km W Coro, Cueva del Guano, 120 m elev., 22-23.VII.68, N. E. Peterson, J. Matson; 5 LL from *Pteronotus davyi*, 49 km N, 34 km W Coro, Moruy, 55 m elev., 11.VII.68, N. E. Peterson, J. Matson.

Sucre: 2 ♂♂, 3 ♀♀, 11 NN, 153 LL from 14 *Mormoops megalophylla*, 9 km N, 4 km E Guiria nr. Río Salado, 90 m elev., 3-7.VI.67, N. E. Peterson, et al.; 2♀♀ from 1 *Mormoops megalophylla*, 10 km N and 5 km E Güiria, El Mango, 90 m elev., 7.VI.67, N. E. Peterson, et al.; 84 LL from 6 *Mormoops megalophylla*, 7 km N, 5 km E Güiria, Ensenada Cauranta, 1 m elev., 3-14.VI.67, N. E. Peterson, et al.

Yaracuy: 11 LL from 1 *Pteronotus psilotis*, 19 km NW Urama, 25 m elev., 8.III.66, A. L. and M. D. Tuttle.

Antricola sp. probably *silvai*

Material Examined

Falcon: 3 NN were found on *Leptonycteris curasoae* and *Pteronotus davyi*.

Distribution and Hosts

Adults and nymphs of *Antricola silvai* are usually found in caves (Černý, 1969). However, 2 females were taken from *Mormoops megalophylla* in the present study. Larvae have been found on a variety of bat species.

This is the first record of *A. silvai* from Venezuela. It was previously known only from Cuba and Curacao (Kohls, 1969).

Genus *Argas* Latreille, 1795

Argas (*Persicargas*) *miniatus* Koch, 1844.

Argas miniatus Koch 1844:219.

For information regarding the synonymy of this species see Kohls, et al. 1970.

Distribution and Hosts

Information included here is based on recent treatment of *Argas miniatus* by Kohls, et al. (*loc. cit.*). Chickens are the only hosts reported for this species.

Vogelsang and Santos Dias (1953*b*) report *A. miniatus* from Venezuela and Kohls, et al. (*loc. cit.*). list Panama, Trinidad, Colombia, British Guiana, and Brazil.

Genus *Ornithodoros* Koch, 1844

Most ticks taken from animals are larvae, while adults and nymphs are more often collected from resting places of the hosts rather than on the host itself. A key to the larvae of the genus *Ornithodoros* is given by Jones and Clifford (1972).

Ornithodoros (*Alectorobius*) *azteci* Matheson, 1935

Ornithodorus azteci Matheson, 1935:349.

Ornithorodos anduzei Matheson, 1941.

Material Examined

Apure: 2 LL from 2 *Macrophyllum macrophyllum*, 46 km NE Pto. Paez, Hato Cariben, Río Cinarueo, 76 m elev., 6,28.XII.65, A. L. and M. D. Tuttle; 1 L from *Carollia perspicillata* as above, 24.XII.65, A. L. and M. D. Tuttle.

Bolívar: 1 L from *Peropteryx macrotis*, 85 km SSE El Dorado, km 125, 374 m elev., 29.V.66, A. L. and M. D. Tuttle.

Carabobo: 1 L from *Carollia perspicillata*, 5-6 km E, NE Urama, 25 m elev., 6.III.66, N. E. Peterson; 1 L from *Lonchorhina aurita*, 3 km W Montalbán, La Leonera, 1393 m elev., 22.XI.67, A. L. Tuttle.

Dto. Federal: 1 L from *Carollia perspicillata*, 3 km S, 46 km W Caracas, nr. El Limón, 380 m elev., 21.VIII.66, N. E. Peterson.

Falcón 1 L from *Peropteryx kappleri*, 3 km N, 5 km E Mirimire, nr. La Cumbre, 260 m elev., 16.XI.67, N. E. Peterson, et al.; 2 LL from 1 *Glossophaga longirostris*, 19 km N, 4 km E Mirimire nr. Aquide, 5 m elev., 13.XI.67, N. E. Peterson, et al.; 3 LL from 1 *Artibeus jamaicensis*, 5 km S, 9 km E Mirimire, nr. San Paíto, 270 m elev., 17.XI.67, N. E. Peterson, et al.

Miranda: 3 LL from 1 *Peropteryx macrotis*, 15 km SE Caracas, nr. El Encantado, 730 m elev., 9.I.66, N. E. Peterson; 2 LL from 1 *Zygodontomys brevicauda*, 6 km S Río Chico, 17.XI.66.

Sucre: 6 LL from 2 *Glossophaga soricina*, 8 km N, 5 km E Güiria, Hda. La Concordia, 7 m elev., 15-16.VI.67, N. E. Peterson, et al.; 1 L from *Phyllostomus hastatus*, 9 km N, 4 km E Güiria, nr. Rio Salado, 90 m elev., 7.VI.67, N. E. Peterson, et al.

T. F. Amazonas: 1 L from *Carollia perspicillata*, 25 km SSE Puerto Ayacucho, Paría. 114 m elev., 17.IX.67, A. L. Tuttle, et al.

Trujillo: 59 LL from 18 *Carollia perspicillata*, 23 km NW Valera, nr. Agua Santa, 90 m elev., 28.VIII and 7-18.X.65., N. E. Peterson; 12 LL from 2 *Desmodus rotundus*, as above except 7.IX.65 and 16.X.65, N. E. Peterson; 45 LL from 5 *Carollia perspicillata*, 5,14.IX.65, 18 km N Valera, nr. Agua Viva, 164 m elev., N. E. Peterson; 9 LL from 2 *Glossophaga soricina*, 23 km NW Valera nr. Agua Santa, 90 m elev., 23.VIII and 7.IX.65, N. E. Peterson; 5 LL from 2 *Carollia perspicillata*, 18 km N Valera, nr. Agua Viva, 164 m elev., 6.X.65, N. E. Peterson; 2 LL from 1 *Desmodus rotundus*, 18 km N Valera, nr. Agua Viva, 164 m elev., 7.X.68, N. E. Peterson; 6 LL from 4 *Trachops cirrhosus*, 23 km NW Valera, nr. Agua Santa 90 m elev., 8.X.65, N. E. Peterson; 4 LL from 3 *Carollia perspicillata*, 18 km N

Valera, nr. Agua Viva, 164 m elev., 3.IX.65, N. E. Peterson; 7 LL from 3 *Desmodus rotundus*, 23 km NW Valera, nr. Agua Santa, 90 m elev., 2.IX and 18-19.X.65, N. E. Peterson; 17 LL from 3 *Carollia perspicillata*, as above, 28.VIII and 22.X.65, N. E. Peterson; 1 L from *Lonchorhina aurita*, 18 km N Valera, nr. Agua Viva, 164 m elev., 3.IX.65, N. E. Peterson; 1 L from *Lonchorhina aurita*, 25 km N Valera, nr. Agua Santa, 90 m elev., 21.X.65, N. E. Peterson.

YARACUY: 1 L from *Carollia perspicillata*, 19 km NW Urama, ? elev., 14.XI.65, A. L. and M. D. Tuttle; 1 L from *Glossophaga soricina*, as above, A. L. and M. D. Tuttle; 22+ LL from 1 *Carollia perspicillata*, 8 km W San Felipe, Minas de Aroa 400 m elev., 6.XII.67, N. E. Peterson, *et al.*

YARACUY AND CARABOBO: 4 LL from 2 *Carollia perspicillata*, 19 km NW Urama, Km 40, 5-25 m elev., 20,25.X.65, A. L. and M. D. Tuttle.

YARACUY AND FALCÓN: 1 L from *Desmodus rotundus*, 35 km NW Pto. Cabello, Boca de Yaracuy, 2 m elev., 27.IX.65, A. L. and M. D. Tuttle.

ZULIA: 1 L from *Carollia* sp., Kasmera, nr. Sierra de Perijá, 10 km S, 18 km W Machiques, 270 m elev., 22.IV.68, N. E. Peterson, J. Matson; 1 L from *Artibeus* sp. D, as above, 15.IV.68, N. E. Peterson, et al.; 1 L from *Lonchorhina aurita*, as above, 20.IV.68, N. E. Peterson, J. Matson; 3 LL from *Desmodus rotundus*, as above, N. E. Peterson, J. Matson.

Ornithodoros probably *azteci*

MATERIAL EXAMINED

BOLIVAR: 2 LL from 1 *Peropteryx macrotis*, 85 km SSE El Dorado Km 125, 374 m elev., 29.V.66, A. L. and M. D. Tuttle.

CARABOBO: 2 LL from 1 *Carollia perspicillata*, 5-6 km ENE Urama, 25 m elev., 6.III.66, A. L. and M. D. Tuttle.

DISTRIBUTION AND HOSTS

All larvae were taken from a variety of bat hosts. A similar group of hosts is given for *O. azteci* in Panama by Fairchild, et. al. (1966) and for Venezuela by Vogelsang and Santos Dias (1953*a*).

This species was first reported from Venezuela by Matheson (1941) (as *O. anduzei*). It has also been reported from Cuba, Mexico, Colombia, Trinidad, Jamaica, and the Lesser Antilles (Kohls, 1969).

Ornithodoros (*Alectorobius*) *boliviensis* Kohls and Clifford, 1964

Ornithodoros boliviensis Kohls and Clifford, 1964:792.

MATERIAL EXAMINED

BOLIVAR: 7 LL from 1 *Eptesicus brasiliensis*, 59 km SE El Dorado, Km 74, El Manaco, 150 m elev., 24.VI.66, A. L. and M. D. Tuttle.

CARABOBO: 3 LL from 1 *Molossus ater*, Montalbán, 1091 m elev., 5.XI.67, A. L. Tuttle; 1 L from *Molossus bondae*, as above, A. L. Tuttle.

MONAGAS: 31+ LL from 2 *Molossus ater*, 3 km N, 4 km W Caripe, San Augustín, 1160 m elev., 7, 10.VII.67, N. E. Peterson, et al.

SUCRE: 1 L from *Noctilio leporinus*, 21 km E Cumaná, Hda. Tunantal, 0 m elev., 10.XII.66, N. E. Peterson, et al.

T. F. AMAZONAS: 32 LL from 10 *Molossus ater*, nr. Tamanaco, NE San Juan, Río Manapiare, 155 m elev., 14-24.VII.67, M. D. Tuttle, F. L. Harder.

Ornithodoros probably *boliviensis*

MATERIAL EXAMINED

BOLÍVAR: 4 LL from 1 *Molossops planirostris*, 14 km S, 45 km E Caicara, Hato La Florida, 50 m elev., 19.IV.67, N. E. Peterson, et al.

MONAGAS: 24 LL from 1 *Molossus ater*, 3 km N, 4 km W Caripe, San Agustín, 1180 m elev., 27.VI.67 N. E. Peterson, et al.

YARACUY AND CARABOBO. 2 LL from 1 *Mimon crenulatum*, 19 km NW Urama, Km 40, 5-25 m elev., 27.X.65, A. L. and M. D. Tuttle.

DISTRIBUTION AND HOSTS

In Bolivia adults and nymphs have been collected in huts, and larvae have been collected on *Molossus major* and *Myotis nigricans* (Kohls and Clifford, 1964).

These collections represent a new record for Venezuela and indicate that additional collections may further expand the distribution of this species. The RML collection also contains 5 LL from *Molossus sinaloae*, 6 mi. E. Limón, 2700 ft., Jalisco, western Mexico, 26-IX-65.

Ornithodoros (*Alectorobius*) *brodyi* Matheson, 1935

Ornithodoros brodyi Matheson, 1935:351.

MATERIAL EXAMINED

ZULIA: 1 L from *Carollia perspicillata*, 10 km S, 18 km W Machiques, Kasmera, 270 m elev., 15.IV.68, N. E. Peterson, et al.; 1 L from *Carollia* sp., as above; 1 L off *Lonchorhina aurita*, as above, 17.IV.68, N. E. Peterson, et al.; 1 L off *Lonchorhina aurita*, Kasmera, nr. Sierra de Perijá, 10 km S, 18 km W Machiques, 270 m elev., 20.IV.68, N. E. Peterson, J. Matson.

DISTRIBUTION AND HOSTS

Larvae of *O. brodyi* are commonly found on the short-tailed bat, *Carollia perspicillata*, and a variety of other bats. Adults and nymphs have been found in crevices in the walls and ceilings of caves where bats rest (Fairchild et al., 1966).

This is the first report of this species from Venezuela. It has also been reported from Mexico, Panama, Guatemala, and Cuba. In addition, the RML collection contains: 1 L from *Peropteryx kappleri* from Guatemala; 2 LL from *Natalus tumidirostris* and 3 LL (3 separate collections) from *Carollia perspicillata* from Colombia.

Ornithodoros (*Alectorobius*) *echimys*
Kohls, Clifford, and Jones, 1969

Ornithodoros (*Alectorobius*) *echimys* Kohls, Clifford, and Jones, 1969:1042.

MATERIAL EXAMINED

APURE: 15 LL (paratypes) from 2 *Echimys semivillosus*, 38 km NNW Pto. Paez, Río Cinaruco, 76 m elev., 15,28.I.66, A. L. and M. D. Tuttle; 11 LL (not paratypes) as above, A. L. and M. D. Tuttle.

LARA: 2 LL (not paratypes) from 1 *Echimys semivillosus*, 10 km N El Tocuyo, Río Tocuyo, 518 m elev., 18.VII.68, A. L. Tuttle; 27 LL (not paratypes) from 3 *Echimys semivillosus*, as above, 17-18.VII.68, A. L. Tuttle.

YARACUY AND CARABOBO: 5 LL (holotype and paratypes), from *Echimys semivillosus*, 19 km NW Urama, Km 40, 5-25 m elev., 17.X.65, A. L. and M. D. Tuttle.

DISTRIBUTION AND HOSTS

Ornithodoros echimys is known only from the larvae and at present is almost exclusively recorded from spiny rats in Venezuela. However, the RML collection also contains a single larva from *Marmosa* sp., Dept. Beni, Río Itenez, opp. Costa Marques, Bolivia, 7.IX.64 (RML 49577), which indicates that future collecting in this region may further expand its known distribution and host range.

Ornithodoros (*Alectorobius*) *eptesicus*
Kohls, Clifford, and Jones, 1969

Ornithodoros (*Alectorobius*) *eptesicus* Kohls, Clifford, and Jones, 1969:1037.

MATERIAL EXAMINED

DTO. FEDERAL: 3 LL (holotype and paratypes) from *Eptesicus montosus*, 4 km NNW Caracas, 1400 m elev., 1.VIII.65, N. E. Peterson, et al.; 17 LL (paratypes) from 4 *Eptesicus montosus*, as above except 1507-1599 m elev., 22,25.VII.65, N. E. Neterson, et al.; 2 LL (not paratypes) as above, 1400 m elev., 1.VIII.65, N. E. Peterson, et al.

DISTRIBUTION AND HOSTS

At present this species is known only from *Eptesicus montosus* from Venezuela as detailed above.

Ornithodoros (*Alectorobius*) *hasei*
(Schulze, 1935)

Argas hasei Schulze, 1935:34.

Ornithodoros dunni Matheson, 1935.

MATERIAL EXAMINED

APURE: 2 ♂♂, 4 ♀♀, 3 NN, 863 LL from 59 *Noctilio labialis*, 46 km NE Pto. Paez, Hato Cariben, Río Cinaruco, 76 m elev., 15.XII.65-17.I.66, A. L. and M. D. Tuttle; 255 LL from 21 *Noctilio labialis*, 17.I.66, 38 km NW Pto. Paez, Río Cinaruco, 76 m elev., A. L. and M. D. Tuttle; 1 L from *Noctilio leporinus*, 38 km NW Pto. Paez, Río Cinaruco, 13.I.66, A. L. and M. D. Tuttle; 1 L from *Lonchorhina orinocensis*, 46 km NE Pto. Paez, Hato Cariben, Río Cinaruco, 76 m elev., 24.XII.65, A. L. and M. D. Tuttle; 1 L from *Glossophaga longirostris*, as above, 14.XII.65, A. L. and M. D. Tuttle; 1 L from *Tadarida gracilis*, 38 km NW Pto. Paez, Río Cinaruco, 76 m elev., 21.I.66, A. L. and M. D. Tuttle; 1 L from *Desmodus rotundus*, as above, 13.I.66, A. L. and M. D. Tuttle; 1 ♀, 2 NN, 1 L from 4 *Molossus ater*, as above, 17.I.66, A. L. and M. D. Tuttle; 1 ♂, 1 N, 1 L from 3 *Molossus ater*, 46 km NE Pto. Paez, Hato Cariben, Río Cinaruco, 76 m elev., 13,17.XII.65, A. L. and M. D. Tuttle; 1 L from *Molossus ater*, as above, 28.XII.65, A. L. and M. D. Tuttle; 1 ♂, 1 N from 1 *Molossus ater*, as above, except 38 km NW, 17.I.66, A. L. and M. D. Tuttle.

BOLÍVAR: 35 LL from 4 *Molossus ater*, 59 km SE El Dorado, Km 74, El Manaco, 150 m elev., 8-17.VI.66, A. L. and M. D. Tuttle; 6 LL from 1 *Artibeus jamaicensis*, 5 km NW Guasipati, 190 m elev., 29.IV.66, A. L. and M. D. Tuttle; 35+ LL from 1 *Artibeus jamaicensis*, 14 km S, 45 km E Caicara, Hato La Florida, 50 m elev., N. E. Peterson, et al.

CARABOBO: 2 LL from 1 *Molossus bondae*, Montalbán, 1091 m elev., 5.XI.67, A. L. Tuttle; 9 LL from 1 *Phyllostomus hastatus*, 6 km N Urama, 60 m elev., 17.III.66, A. L. and M. D. Tuttle.

DTO. FEDERAL: 8 LL from 1 *Sturnira lilium*, 4 km NNW, Caracas, 1465 m elev., 23.VII.65, N. E. Peterson, et al.

MIRANDA: 59+ LL from 4 *Noctilio labialis*, 5 km E Río Chico, nr. Puerto Tuy, 0 m elev., 5,17.XI.66, N. E. Peterson, et al.; 50+ LL from 1 *Noctilio leporinus*, 10 km E Río Chico nr. Tacarigua La Laguna, 0 m elev., 9.XI.66, N. E. Peterson, et al.; 5 LL from 1 *Noctilio leporinus*, 5 km E Río Chico, nr. Puerto Tuy, 0 m elev., 17.XI.66, N. E. Peterson, et al.

MONAGAS: 36+ LL from 10 *Molossus ater*, 2-3 km N, 4 km W Caripe, San Agustín, 1160-1180 m elev., 26VI-7.VII.67, N. E. Peterson, et al.; 25 LL from 1 *Molossus ater*, nr. San Agustín, 1180 m elev., 8:VII.67, N. E. Peterson, et al.; 1 L from *Akodon urichi*, 3 km N, 4 km W Caripe, San Agustín, 1180 m elev., 24.VI.67, N. E. Peterson, et al.; 1 L from *Chiroderma salvini*, 3 km N, 4 km W Caripe, San Agustín, 1160 m elev., 27.VI.67, N. E. Peterson, et al.

SUCRE: 30+ LL from 2 *Sturnira lilium*, 14 km E Cumaná, Hda. Guanital, 0 m elev., 8-9.XII.66, N. E. Peterson, et al.; 51+ LL from 2 *Noctilio leporinus*, 21 km E Cumaná, Hda. Tunantal, 0-15 m elev., 10,17.XII.66, N. E. Peterson, et al.; 12 LL from 1 *Molossus ater*, 14 km E Cumaná, Hda. Guanital, 0 m elev., 9.XII.66, N. E. Peterson, et al.; 1 L from *Phyllostomus hastatus*, 5 km S, 25 km E Carúpano, Manacal, 380 m elev., 3.VIII.67, N. E. Peterson, et al.; 2 LL from 1 *Desmodus rotundus*, 21 km E Cumaná, Hda. Tunantal, 0 m elev., 9.XII.66, N. E. Peterson, et al.; 1 L from *Mormoops megalophylla*, 9 km N, 4 km E Güiria, nr. Río Salado, 90 m elev., 7.VI.67, N. E. Peterson, et al.

TRUJILLO: 8 LL from 1 *Noctilio labialis*, 23 km NW Valera, nr. Agua Santa, 90 m elev., 24.VIII.65, N. E. Peterson; 2 LL from 1 *Phyllostomus hastatus*, as above, 18.X.65, N. E. Peterson.

T. F. AMAZONAS: 88 LL from 6 *Noctilio labialis*, 2 km N Tamanaco, nr. San Juan, Río Manapiare, 155 m elev., 17-19.VII.67, M. D. Tuttle, F. L. Harder; 75+ LL from 1 *Noctilio labialis*, as above, 155 m elev., 18.VII.67, M. D. Tuttle, F. L. Harder; 6 LL from 1 *Molossus ater*, Tamanaco, ca. 4 km NE San Juan, Río Manapiare, 155 m elev., 14.VII.67, M. D. Tuttle, F. L.

Harder; 1 L from *Phyllostomus hastatus*, San Juan, Río Manapiare, 155 m elev., 17.VII.67, M. D. Tuttle, F. L. Harder; 1 L from *Phyllostomus hastatus*, nr. Moracoy, 15 km down Río Manapiare from San Juan, 155 m elev., 17.VII.67, M. D. Tuttle, F. L. Harder; 11 LL from *Noctilio labialis*, *Myotis albescens*, (two labels in vial), ca. 2 km N Tamanaco, nr. San Juan, Río Manapiare, 18,26.VII.67, M. D. Tuttle, F. L. Harder; 14 LL from 4 *Molossus ater*, nr. Tamanaco, ca. 4 km NE San Juan, Río Manapiare, 155 m elev., 14,19.VII.67, M. D. Tuttle, F. L. Harder; 1 L from *Carollia* sp., as above, 19.VII.67, M. D Tuttle and F. L. Harder; 2 LL from 1 *Molossus ater*, Tamanaco, nr. San Juan, Río Manapiare, 155 m elev., 25.VII.67, M. D. Tuttle, F. L. Harder; 8 LL from 1 *Noctilio labialis*, 20 km SSE Puerto Ayacucho Las Queseras, 135 m elev., 24.IX.67, A. L. Tuttle, *et al.*; 2 LL from 1 *Molossus ater*, 2 km N Tamanaco, nr. San Juan, Río Manapiare, 155 m elev., 17.VII.67, M. D. Tuttle, F. L. Harder; 2 LL from 1 *Molossus ater*, Tamanaco, ca. 4 km NE San Juan, Río Manapiare, 155 m elev., 14.VII.67, M. D. Tuttle, F. L. Harder; 105+ LL from 2 *Noctilio labialis*, Moracoy, nr. San Juan, W side Río Manapiare, 155 m elev., 24.VII.67, M. D. Tuttle, F. L. Harder; 57+ LL from 4 *Noctilio labialis*, nr. Tamanaco, ca. 4 km NE San Juan, Río Manapiare, 155 m elev., 14.VII.67, M. D. Tuttle, F. L. Harder; 200+ LL from 2 *Noctilio labialis*, W side Río Manapiare, nr. San Juan, 155 m elev., 24.VII.67. M. D. Tuttle, F. L. Harder; 7 LL from 2 *Molossus ater*, ca. 2 km N Tamanaco, nr. San Juan, Río Manapiare, 155 m elev., 24.VII.67, M. D. Tuttle, F. L. Harder; 5 LL from 2 *Tadarida gracilis*, Boca Mavaca, Río Orinoco, 84 km SSE Esmeralda, 185 m elev., 14.II.66, A. L. and M. D. Tuttle; 100+ LL from 1 *Noctilio labialis*, nr. Moracoy, ca. 15 km down Río Manapiare from San Juan, 155 m elev., 14.VII.67, M. D. Tuttle, F. L. Harder; 50+ LL from 1 *Phyllostomus hastatus*, San Juan, Río Manapiare, 155 m elev., 17.VII.67, M. D. Tuttle, F. L. Harder; 3 LL from 1 *Tadarida gracilis*, Río Cunucunuma, nr. Belén, 150 m elev., 13.I.67, M. D. Tuttle, F. L. Harder; 25+ LL from 1 *Phyllostomus hastatus*, Moracoy, nr. Río Manapiare. 155 m elev., 13.VII.67, M. D. Tuttle, F. L. Harder; 1 L from *Phyllostomus hastatus*, nr. Moracoy, 15 km down Río Manapiare from San Juan, 155 m elev., M. D. Tuttle. F. L. Harder; 20+ LL from 1 *Uroderma magnirostrum*, nr. San Juan, Río Manapiare, 155 m elev., 17.VII.67, M. D. Tuttle, F. L. Harder; 4 LL from 2 *Molossus ater*, ¼ km N San Juan, W side Río Manapiare, 155 m elev., 5.VII.67, M. D. Tuttle, F. L. Harder; 1 L from *Carollia perspicillata*, W side Río Manapiare, nr. San Juan, 155 m elev., 24.VII.67, M. D. Tuttle, F. L. Harder; 1 L from *Artibeus jamaicensis*, San Juan. Río Manapiare, 155 m elev., 24.VII.67, M. D. Tuttle, F. L. Harder; 100+ LL from 1 *Noctilio labialis*, as above, 20.VII.67, M. D. Tuttle, F. L. Harder; 1 L from *Noctilio labialis*, nr. San Juan, E side Río Manapiare, 155 m elev., 19.VII.67. M. D. Tuttle, F. L. Harder; 1 L from *Molossus ater*, 2 km N Tamanaco, nr. San Juan, Río Manapiare, 155 m elev., 19.VII.67, M. D. Tuttle. F. L. Harder; 25 LL from 6 *Neoplatymops mattogrossensis*, 33 km SSE Puerto Ayacucho, El Raudal. 195 m elev., 4,10.X.67, A. L. Tuttle.

YARACUY: 1 L from *Noctilio labialis*, about 10 km NW Urama, 25 m elev., 11.III.66, A. L. and M. D. Tuttle; 3 LL from 1 *Noctilio labialis*, as above except 14.III.66. A. L. and M. D. Tuttle; 1 L from *Molossus bondae*, as above, A. L. and M. D. Tuttle; 50+ LL from 1 *Noctilio labialis*, 19 km NW Urama, 25 m elev., 9.III.66, A. L. and M. D. Tuttle; 4 LL from 1 *Rhogeëssa tumida*, as above, 5-25 m elev., 27.X.65, A. L. and M. D. Tuttle; 4 LL from 1 *Phyllostomus hastatus*, 13 km NW Urama. Río Yaracuy, 25 m elev., 20.III.66, A. L. and M. D. Tuttle; 2 LL from 1 *Phyllostomus hastatus*, about 11 km NW Urama, nr. El Central, 25 m elev., 14.III.66, A. L. and M. D. Tuttle.

YARACUY AND CARABOBO: 5 LL from 2 *Mimon crenulatum*, 19 km NW Urama Km 40, 5-25 m elev., 26.X.65, A. L. and M. D. Tuttle; 54+ LL from 1 *Noctilio labialis*, Yaracuy—Carabobo border, NW of Urama, 17.III.66, A. L. and M. D. Tuttle.

YARACUY AND FALCÓN: 92+ LL from 3 *Noctilio labialis*, 35 km NW Pto. Cabello, Boca de Yaracuy, 2 m elev., 22,29.IX; 2.X.65, A. L. and M. D. Tuttle; 1 L from *Desmodus rotundus*, as above, 30.IX.65, A. L. and M. D. Tuttle.

ZULIA: 2 LL from 1 *Peropteryx* sp., 10 km S, 18 km W Machiques, Kasmera, 270 m elev., 15.IV.68, N. E. Peterson, et al.; 4 LL from 1 *Rhogeëssa minutilla*, 114 km N, 32 km W Maracaibo, nr. Cojoro, 15 m elev., 24.VI.68, N. E. Peterson, J. Matson; 2 LL from 1 *Noctilio leporinus*, 42 km WNW Encontrados, El Rosario, 5.III.68, 24 m elev., A. L. Tuttle; 4 LL from 2 *Noctilio leporinus*, 5, 28.III.68, A. L. Tuttle; 1 L from *Noctilio labialis*, as above, 5.III.68, A. L. Tuttle.

DISTRIBUTION AND HOSTS

Larvae of *O. hasei* are common on a variety of bats throughout its geographic range. Adults are less commonly collected on bats but have been found in tree holes and old buildings containing roosting bats (Cooley and Kohls 1944, Fairchild, et al. 1966).

This species was originally described by Schulze (1935) from material collected in Venezuela. It has also been recorded from Brazil, Panama, Costa Rica, Bolivia, Nicaragua, Mexico, British Guiana, Martinique, Guadeloupe, Barbuda and Trinidad. Further, the collections contain larvae (unpublished records) from bats in Guatemala, Peru, Colombia, Dominica, Uruguay, St. Croix, and the Dominican Republic.

During examination of this vast array of specimens, considerable variation has been noted at different localities. It is entirely possible that extensive studies including all stages in the life cycle would disclose the existence of several new species in the material here recorded as *hasei*.

Ornithodoros (*Alectorobius*) *marmosae*
Jones and Clifford, 1972

Ornithodoros marmosae Jones and Clifford, 1972:736.

MATERIAL EXAMINED

FALCÓN: 304+ LL from 35 *Marmosa robinsoni*, Capatárida, 40-55 m elev., 19-26.VI.68, A. L. Tuttle; 25+ LL from 2 *Oryzomys concolor*, as above. 24-25.VI.68, A. L. Tuttle; 139 LL from 14 *Marmosa* *robinsoni,* 48 km N, 46 km W Coro, Yabuquiva, 13 m elev., 17-20.VII.68, N. E. Peterson, J. Matson; 120 LL from 10 *Marmosa robinsoni,* 48-49 km N, 33-34 km W Coro, Moruy, 55-90 m elev., 5-13.VII.68, N. E. Peterson, J. Matson.; 28+ LL from 4 *Marmosa robinsoni,* 48 km N, 46 km W Coro, Yabuquiva, 13 m elev., 17-18.VII.68, N. E. Peterson, J. Matson.

Zulia: 5 LL from 1 *Marmosa robinsoni,* 114 km N, 32 km W Maracaibo, nr. Cojoro, 15 m elev., 1.VII.68, N. E. Peterson, J. Matson.

Colombia: Dpto. Guajira, 12+ LL from 1 *Marmosa robinsoni,* 119 km N, 32 km W Maracaibo, La Isla, 15 m elev., N. E. Peterson, J. Matson.

Distribution and Hosts

Ornithodoros marmosae has been found almost exclusively on the murine opossum in Venezuela as detailed above. In addition, two collections have been reported from mice of the genus *Rhipidomys* in Venezuela. Jones and Clifford (1972) also record several larvae from *Marmosa* sp. in Colombia.

Ornithodoros (*Alectorobius*) *puertoricensis* Fox, 1947

Ornithodoros puertoricensis Fox, 1947:253.

Material Examined

Apure: 2 LL from 1 *Sigmomys alstoni,* 46 km NE Pto. Paez, Hato Cariben, Río Cinaruco, 76 m elev., 10.XII.65, A. L. and M. D. Tuttle.

Bolívar: 19 LL from 6 *Proechimys guyannensis,* 12 km S, 43 km E Caicara, Hato La Florida, 43-45 m elev., 15.IV-1.V.67, N. E. Peterson, et al.; 11 LL from 2 *Proechimys guyannensis,* as above, 43 m elev., 25,29.IV.67, N. E. Peterson, et al.

Carabobo: 1 L from *Proechimys semispinosus,* 1.7 km NNW Montalbán, Montero, 1091 m elev., 7.XI.67, A. L. Tuttle; 27 LL from 1 *Proechimys semispinosus,* Montalbán, Potrerito, 1091 m elev., 25.XI.67, A. L. Tuttle.

Falcon: 4 LL from 1 *Proechimys semispinosus,* 2 km N, 10 km E Mirimire, nr. La Cumbre, +120 m elev., 3.XI.67, N. E. Peterson, et al.; 16+ LL from 3 *Proechimys semispinosus,* 4-5 km N, 10-13 km E Mirimire, nr. La Pastora, 122-130 m elev., 11-23.XI.67, N. E. Peterson, et al.; 15+ LL from 1 *Tamandua longicaudata,* 6 km SE Capatárida, Sividigua, ? elev., 26.VI.68, A. L. Tuttle; 1 L from *Marmosa robinsoni,* Capatárida, 40 m elev., 26.VI.68, A. L. Tuttle; 5 LL from 1 *Sylvilagus floridanus,* Capatárida, 40 m elev., 1.VII.68, A. L. Tuttle; 1 L from *Conepatus semistriatus,* 49 km N, 34 km W Coro, nr. Moruy, 55 m elev., 9.VII.68, N. E. Peterson, J. Matson; 1 L from lizard (tick a stray specimen?), as above except 33 km W Coro, 90 m elev., 6.VII.68, N. E. Peterson, J. Matson; 10+ LL from 1 *Proechimys semispinosus,* 49 km N, 32 km W Coro, Cerro Santa Ana, 530 m elev., 25.VII.68, N. E. Peterson, J. Matson; 2 LL from 1 *Marmosa robinsoni,* 48 km N, 46 km W Coro, Yabuquiva, 13 m elev., 17.VIII.68, N. E. Peterson, J. Matson.

Guárico: 2 LL from 1 *Proechimys semispinosus,* 34 km S, 12 km W San Juan de los Morros, Hato Las Palmitas, 181 m elev., 3.I.68, N. E. Peterson, et al.; 4 LL from 2 *Marmosa robinsoni,* as above, 5-6.I.68, N. E. Peterson, et al.; 2 L from 1 *Marmosa* sp., as above, 6.I.68, N. E. Peterson, et al.; 18+ LL from 1 *Proechimys semispinosus,* as above, 7.I.68, N. E. Peterson, et al.; 8+ LL from 1 *Proechimys semispinosus,* as above, Hato Las Palmitos, 5.I.68, N. E. Peterson, et al.

Lara: 72 LL from 7 *Proechimys semispinosus,* 10 km N El Tocuyo, Río Tocuyo, 518 m elev., 15-16.VII.68, A. L. Tuttle; 15+ LL from 1 *Proechimys semispinosus,* 10 km NE Tocuyo, Caserio Boro, 537 m elev., 15.VII.68, A. L. Tuttle; 35+ LL from 4 *Proechimys semispinosus,* 10 km N El Tocuyo, Río Tocuyo, 518 m elev., 15.VII.68, A. L. Tuttle; 10+ LL from 1 *Proechimys semispinosus,* as above, A. L. Tuttle.

Monagas: 1 L from *Zygodontomys brevicauda,* Hato de Bejuco, 47 km SE Maturín, 36 m elev., 2.VIII.66, A. L. and M. D. Tuttle.

T. F. Amazonas: 1 L from *Dasyprocta fuliginosa,* Río Manapiare, San Juan, 155 m elev., 7.VII.67, M. D. Tuttle, F. L. Harder.

Trujillo: 5 LL from 1 *Artibeus lituratus* (questionable host?) 20 km WNW Valera, 134 m elev., 27.VIII.65, N. E. Peterson; 7 LL from 1 *Iguana* sp., Valle Verde, 46 km WNW Valera, nr. Santa Apolonia, 29 m elev., 29.X.65, N. E. Peterson; 6 LL from 1 *Monodelphis brevicaudata,* 23 km NW Valera, nr. Agua Santa, 90 m elev., 3.IX.65, N. E. Peterson; 4 LL from 1 *Monodelphis brevicaudata,* 28 km NW Valera, nr. El Dividive, 90 m elev., 16.IX.65, N. E. Peterson.

Yaracuy and Falcón: 6 LL from 1 *Monodelphis brevicaudata,* (border) 35 km NW Pto. Cabello, Boca de Yaracuy, 2 m elev., 29.IX.65, A. L. and M. D. Tuttle.

Yaracuy: 1 L from *Proechimys semispinosus,* 19 km NW Urama, ? elev., 12.XI.65, A. L. and M. D. Tuttle; 11 LL from 1 *Proechimys semispinosus,* 8 km N, 18 km W San Felipe, Minas de Aroa, 395 m elev., 11.XII.67, N. E. Peterson, et al.

Ornithodoros near *puertoricensis*

Material Examined

Guárico: 2 LL from 2 *Sylvilagus floridanus,* 16 km NW Barbacoas, nr. Hda. Los Marmones, 228 m elev., 2-3.III.66, N. E. Peterson.

Distribution and Hosts

Adults of *O. puertoricensis* have not been recorded from animals in nature; however, it is assumed they remain hidden in the nests and other places frequented by their hosts. Larvae have been recorded from a number of rodents as well as from *Sylvilagus brasiliensis* and *S. floridanus* (Fairchild, et al., 1966; Kohls, 1969), and man (Kohls, et al., 1965). The records listed herein considerably extend the host range of this species; however, the record from a bat is considered questionable.

These are the first records for *O. puertoricensis* in Venezuela. It has also been reported from Panama, Trinidad, Puerto Rico, Colombia, Jamaica, Guadeloupe, and the Virgin Islands. Unpublished RML records list collections from Nicaragua, Surinam, and Uruguay.

Ornithodoros (*Alectorobius*) *rossi*
Kohls, Sonenshine, and Clifford, 1965

Ornithodoros (*Alectorobius*)*rossi* Kohls, Sonenshine, and Clifford, 1965:347.

Material Examined

Miranda: 3 LL from 1 *Peropteryx macrotis,* 15 km SE Caracas, nr. El Encantado, 730 m elev., I.66, N. E. Peterson, et al.; 2 LL from 1 *Peropteryx macrotis,* as above, N. E. Peterson, et al.

Nueva Esparta: 1 L from *Glossophaga longirostris,* 2 km N, 1 km E La Asuncion, Salamanca, 38 m elev., 11.I.67, N. E. Peterson, et al.; 1 L from *Desmodus rotundus,* as above, N. E. Peterson, et al.

T. F. Amazonas: 3 LL from 1 *Lonchorhina orinocensis,* 18 km SE Puerto Ayacucho, El Gavilan, 135 m elev., 11.X.67, A. L. Tuttle.

Ornithodoros rossi or near

Apure: 8 LL from 1 *Peropteryx trinitatis,* 41 km NW Pto. Paez, Río Cinaruco, 76 m elev., 19.I.66, A. L. and M. D. Tuttle.

Distribution and Hosts

Only the larval stage of *Ornithodoros rossi* is known. It was described on the basis of specimens collected from *Leptonycteris nivalis* (=*E. cauborni*) and *Eptesicus fuscus* in Arizona (USA). Kohls, et al. (1965) also recorded several collections from *Macrotus californicus* (=*M. waterhousii*) in Mexico. The above records are the first for this species in Venezuela. Unpublished records also include three lots from bats in Colombia and a single lot from *Macrotus californicus* (=*M. waterhousii*) in California (USA).

Ornithodoros (*Alectorobius*) *setosus*
Kohls, Clifford, and Jones, 1969

Ornithodoros setosus Kohls, Clifford, and Jones, 1969:1036.

Material Examined

Apure: 4 LL from 2 *Tadarida gracilis,* 38 km NNW Pto. Paez, Río Cinaruco, 76 m elev., 26-27.I.66, A. L. and M. D. Tuttle.

Distribution and Hosts

Ornithodoros setosus is known only from larvae and has not been cited since Kohls, et al. (1969) described it from specimens taken from *Tadarida laticaudata* in Brazil and reported it from *Pteronotus parnellii* and *Tadarida europs* (=*T. gracilis*) (see above) in Mexico and Venezuela, respectively.

Ornithodoros (*Alectorobius*) *stageri*
Cooley and Kohls, 1941

Ornithodoros stageri Cooley and Kohls, 1941*b*: 589.

Material Examined

T. F. Amazonas: 4 LL from 2 *Tadarida gracilis,* Río Cunucunuma, nr. Belén, 150 m elev., 13.I.67, M. D. Tuttle, F. L. Harder.

Distribution and Hosts

Ornithodoros stageri has been reported from bats and bat-inhabited caves and mines in Texas, Oklahoma, Arizona, California (USA), and Mexico (Kohls, et al., 1965).

The larvae reported above are the first record of this species in Venezuela. Unpublished RML records list eight lots from *Molossus sp.* in Nicaragua and five lots from *Tararida laticaudata* and *Noctilio labialis* in Brazil. These records indicate that further collecting in South America may expand the distribution and host range of this species even further.

Ornithodoros (*Alectorobius*) *talaje*
(Guérin-Méneville, 1849)

Argas talaje Guérin-Méneville, 1849:342.

Ornithodoros talaje Neumann, 1896.

Alectorobius talaje Pocock, 1907.

Ornithodoros dugesi Mazzotti, 1943.

Material Examined

Apure: 2 LL from 1 *Didelphis marsupialis,* 38 km NNW Pto. Paez, Río Cinaruco, 76 m elev., 21.I.66, A. L. and M. D. Tuttle; 1 L from *Zygodontomys brevicauda*, as above, A. L. and M. D. Tuttle.

Ornithodoros "*talaje* group"

Apure: 1 ♀ from *Tadarida gracilis,* 38 km NNW Pto. Paez, Río Cinaruco, 76 m elev., 21.I.66, A. L. and M. D. Tuttle.

Yaracuy: 6 LL from 1 *Zygodontomys brevicauda* about 19 km NW Urama, 25 m elev., 6.III.66, A. L. and M. D. Tuttle.

Distribution and Hosts

Ornithodoros talaje has been reported from a variety of hosts, including mammals, birds, and reptiles (Vogelsang and Santos Dias, 1953*a*, Kohls, *et al.*, 1965, Fairchild, *et al.*, 1966). It also takes refuge in cracks in walls of houses and caves and it may attack man. It inflicts a painful bite and is a vector of relapsing fever.

It was first reported from Venezuela by Neumann (1896). Its range extends from Kansas and California (USA) to Argentina.

Ornithodoros (*Alectorobius*) *tiptoni*
Jones and Clifford, 1972

Ornithodoros (*Alectorobius*) *tiptoni* Jones and Clifford, 1972:738.

Material Examined

Sucre: 2 LL (holotype and paratype) from 2 *Noctilio leporinus,* 21 km E. Cumaná, Hda. Tunantal, O m elev., 10.XII.66, N. E. Peterson, et al.

Distribution and Hosts

This species is known only from bats in Venezuela as detailed above.

Ornithodoros (Alectorobius) tuttlei Jones and Clifford, 1972

Ornithodoros tuttlei Jones and Clifford, 1972: 738.

Material Examined

T. F. Amazonas: 4 LL (holotype and paratypes) from 1 *Agouti paca*, 40 km SSE Puerto Ayacucho, 119 m elev., 19.IX.67, A. L. Tuttle; 121+ LL (paratypes) from 1 *Tapirus terrestris*, 15 km SSE Puerto Ayacucho. ? elev., 25.IX.67, A. L. Tuttle.

Distribution and Hosts

Ornithodoros tuttlei has been collected only in Venezuela from tapirs and pacas as detailed above.

Ornithodoros (Alectorobius) yumatensis Cooley and Kohls, 1941

Ornithodoros yumatensis Cooley and Kohls, 1941*b*:592.

Material Examined

Monagas: 7 LL from 3 *Peropteryx kappleri*, 2 km S, 2 km W Caripe, Hda. Tucusito, 854 m elev., 11.VII.67, N. E. Peterson, et al.; 2 LL from 1 *Desmodus rotundus*, as above, 13.VII.67, N. E. Peterson, et al.; 14 LL from 2 *Diphylla ecaudata*, as above, N. E. Peterson, et al.

Nueva Esparta: 2 LL from 2 *Desmodus rotundus*, 2 km N, 1 km E La Asunción, Salamanca, 38-41 m elev., 11,13.I.67, N. E. Peterson et al.

Yaracuy and Carabobo: 10 LL from 1 *Carollia perspicillata*, 19 km NW Urama, Km 40. 5-25 m elev., 25.X.65. A. L. and M. D. Tuttle.

Zulia: 2 LL from 1 *Desmodus rotundus*, 10 km S. 18 km W Machiques, Kasmera, 270 m elev., 17.IV.68, N. E. Peterson, et al.; 5 LL from 2 *Desmodus rotundus*, nr. Sierra de Perija, 10 km S, 18 km W Machiques, Kasmera, 270 m elev., 20.IV.68, N. E. Peterson, J. Matson.

Ornithodoros yumatensis or near

Apure: 1 L from *Peropteryx trinitatis*, 38 km NNW Pto. Paez, Rio Cinaruco, 76 m elev., 19.I.66, A. L. and M. D. Tuttle.

T. F. Amazonas: 1 L from *Desmodus rotundus*, Tamanaco, ca. 4 km NE San Juan, Rio Manapiare, 155 m elev., 25.VII.67, M. D. Tuttle, F. L. Harder.

Zulia: 2 LL from 1 *Peropteryx macrotis*, 10 km S, 18 km W Machiques, Kasmera, 270 m elev., 15.IV.68, N. E. Peterson, et al.

Distribution and Hosts

Ornithodoros yumatensis has previously been reported from bats or bat retreats in California, Arizona, Texas (USA) and in Mexico (Kohls, et al., 1965).

Records included above are the first from Venezuela. Unpublished RML records include larvae from bats in Georgia (USA), Nicaragua, and Colombia. These records demonstrate that this species parasitizes a variety of bats throughout the southern United States, Central America, and northern South America.

Ornithodoros (Subparmatus) marinkellei Kohls, Clifford, and Jones, 1969

Ornithodoros (Subparmatus) marinkellei Kohls, Clifford and Jones, 1969:1040.

Material Examined

Yaracuy: 1 L from *Pteronotus psilotis*, 8 km N, 18 km W San Felipe, Minas de Aroa, 395 m elev., 12.XII.67, N. E. Peterson, et al.

Distribution and Hosts

Prior to the above record this species was known only from bats of the genus *Pteronotus* in Panama and Colombia. Further collecting will undoubtedly expand the known range of this species.

Ornithodoros (Subparmatus) viguerasi Cooley and Kohls, 1941

Ornithodoros viguerasi Cooley and Kohls, 1941*a*: 396.

Material Examined

Sucre: 2 LL from 1 *Mormoops megalophylla*, 7 km N, 5 km E Güiria, Ensenada Cauranta, 1 m elev., 14.VI.67. N. E. Peterson, et al.

Yaracuy: 9 LL from 8 *Pteronotus davyi*, 8 km N, 18 km W San Felipe, Minas de Aroa, 395-400 m elev., 14-23.XII.67, N. E. Peterson, et al.; 2 LL from 2 *Pteronotus suapurensis*, as above, N. E. Peterson, et al.

Distribution and Hosts

Ornithodoros viguerasi has been recorded from bat caves and several species of bats in Cuba and Trinidad (Kohls, et al., 1965) and more recently from Jamaica and Puerto Rico by Tamsitt and Fox (1970). As suggested by Kohls, et al., (1965) the material listed as this species by Fairchild, et al. (1966) from *Pteronotus* sp. in Panama turned out to be a new species, *O. marinkellei*.

The above records are the first for Venezuela. Unpublished RML records include larvae from bats in the Dominican Republic.

Ornithodoros rudis Karsch, 1880

Ornithodoros rudis Karsch, 1880:141-142.

Ornithodoros talaje Dunn, 1923 (in part).

Ornithodoros venezuelensis Brumpt, 1921. In: Brumpt 1936.

Ornithodoros migonei Brumpt, 1936.

MATERIAL EXAMINED

BOLÍVAR: 2 LL from 1 bird, 146 km S, 7 km E Ciudad Bolívar, Hato San José, 298 m elev., 5.IV.67, N. E. Peterson, et al.

DISTRIBUTION AND HOSTS

Ornithodoros rudis was first reported from Venezuela by Bello and Sucre (1917) as *O. furcosus.* Brumpt in 1921 examined these specimens, came to the conclusion they represented a new species, and gave them the name *O. venezuelensis.* Schulze, cited by Osorno-Mesa (1941), compared Karsch's type material with *O. venezuelensis* from Colombia and concluded that they were the same.

Dunn (1927, 1933) considers adults and nymphs of this species to be common in houses and to attack man in Panama, Colombia, and Venezuela. Larvae have been reported to feed on chickens and small mammals. This species has also been reported from Paraguay, Ecuador, and Peru.

Ornithodoros spp.

MATERIAL EXAMINED

APURE: 1 N, 4 LL from the following hosts, *Lonchorhina orinocensis, Molossus ater, Peropteryx trinitatis, Tadarida gracilis, Trachops cirrhosus.*

BOLÍVAR: 14 LL from *Molossus ater, Proechimys guyannensis, Neoplatymops mattogrossensis.*

CARABOBO: 7 LL from the following hosts, *Desmodus rotundus, Proechimys semispinosus.*

DTO. FEDERAL: 1 L from *Molossus ater.*

FALCÓN: 18 LL from the following hosts, *Leptonycteris curasoae, Marmosa robinsoni, Molossus ater, Rhipidomys venezuelae, Saccopteryx bilineata.*

GUÁRICO: 2 LL from *Pteronotus parnellii, Zygodontomys brevicauda.*

MONAGAS: 21 LL from the following hosts, *Diphylla ecaudata, Molossus ater, Myotis nigricans, Zygodontomys brevicauda.*

SUCRE: 2 LL from *Noctilio leporinus, Zygodontomys brevicauda.*

TÁCHIRA: 1 L from *Oryzomys albigularis.*

T. F. AMAZONAS: 5 LL from the following hosts, *Molossus ater, Tadarida gracilis.*

TRUJILLO: 1 L from lizard.

YARACUY: 1 L from *Pteronotus davyi.*

YARACUY AND CARABOBO: 2 LL from *Proechimys semispinosus, Sturnira lilium.*

ZULIA: 2 LL from *Peropteryx macrotis.*

Genus *Otobius* Banks, 1912

Otobius megnini (Dugés, 1884)

Argas megnini Dugés, 1884:197.

A complete synonymy for this species is given by Cooley and Kohls 1944:21.

DISTRIBUTION AND HOSTS

The spinose ear tick occurs mainly on domestic animals but will also feed on a variety of wild mammals and occasionally on birds. It is widely distributed in many parts of the world (Kohls, et al., 1965) and there is a single record of this species from Venezuela by Pinto (1930). Because of its distinctive morphology, misidentification of *O. megnini* is unlikely, and the record is probably valid.

Family Ixodidae

Genus *Amblyomma* Koch, 1844

This genus is represented by 25 species in Venezuela. During identification of the vast number of collections of *Amblyomma* the need for a workable key became clearly apparent. Therefore, a key to the adults of the species of *Amblyomma* in North, Central, and South America is included. Species that occur in Venezuela are marked with an asterisk. *Amblyomma beaurepairei* Vogelsang and Santos Dias, 1953 and *A. guianense* Neumann, 1907 were not included in the key owing to the unavailability of material for study.

Key to the *Amblyomma* of the Western Hemisphere

Males[*]

1. Marginal groove incomplete or absent 2
Marginal groove complete, limiting all festoons 30

2(1). Hypostome 4/4 3
Hypstome 3/3 8

3(2). Coxae II-IV with 1 spur 4
Coxae II-IV with 2 spurs 5

4(3). Coxa I with 2 broad, flat spurs plus an accessory spur situated anteriorly and medial to the 2 regular spurs. Spur on coxa IV very short. Palpal article II dorsally without a spur. Cornua absent .... *A. goeldii*

---

[*] The ♂ of *A. rotundatum* is unknown. The ♀ of *A. crassum* described by Mendez Arocha and Ortiz (1957) may be another species, perhaps *A. sabanerae.*

Coxa I with external spur curved inward; internal broad and flat. Coxa IV with a moderately long spur. Palpal article II dorsally bearing a spur. Cornua present .... *A. multipunctum*°

5(3). Ornamentation distinct 6

Ornamentation indistinct. Scutum with roughened appearance and depressed posterior to pseudoscutum. Short white hairs on venter .... *A. extraoculatum*°

6(5). Coxa I with 2 broad, flat, medium-length spurs. Coxa IV with internal spur directed medially. Scutum well-ornamented around periphery, very smooth, punctations minute, not obvious .... *A. tuberculatum*

Scutum rough or smooth with punctations obvious. Ornamentation only on scapulae 7

7(6). Scutum smooth, cervical grooves short, comma-shaped .... *A. humerale*

Scutum rough due to punctation-free elevations, cervical grooves straight and converging .... *A. sabanerae*

8(2). Coxa I with I spur 9

Coxa I with 2 spurs 10

9(8). Scutum extensively ivory-colored. Each coxa with a conspicuous pale, bulbous, elevation anterolateral to spur .... *A. antillorum*

Scutum extensively dark brown. Pale, bulbous, anterolateral elevations lacking on all coxae .... *A. albopictum*

10(8). Coxa II-III with 2 spurs 11

Coxa II-III with 1 spur 18

11(10). Ventral festoons with tubercles 12

Ventral festoons lacking tubercles 13

12(11). Scutum dark brown, very punctate, large, deep cervical grooves, half-moon shaped. Coxa IV with a short, stumpy spur .... *A. scalpturatum*°

Scutum smooth with a few shallow punctations. Coxa IV with a long pointed spur .... *A. brasiliense*

13(11). With white pilosity around posterior margin of scutum and on venter (Galapagos Islands) 14

Lacking pilosity 15

14(13). Small species, scutum about 2 mm in length, palps about 0.3 mm long, punctations fine, quite shallow .... *A. williamsi*

Larger species, scutum about 3 mm in length, palps about 0.55 mm long, punctations numerous, deep, giving scutum rugose appearance .... *A. pilosum*

15(13). Scutum round in outline except for straight anterolateral margins. Ventrally with one or two pairs of lightly sclerotized round plaques anterior to festoons three and four .... *A. torrei*

Scutum without straight anterolateral margins. Ventrally lacking round sclerotized plaques anterior to festoons 16

16(15). Large species. Length of scutum >3.5 mm. Spurs of coxa I approximately equal in length .... *A. testudinis*

Smaller species. Length of scutum <3.5 mm. External spur of coxa I longer than internal 17

17(16). Scutum elongate in outline; external spur of coxa IV narrowly elongate ca. 0.14+ mm long .... *A. dissimile*

Scutum round in outline with a "cross" appearing in the circular field posteriorly; spur of coxa IV broadly rounded ca. 0.10 mm long .... *A. cruciferum*

°Recorded from Venezuela

18(10). Spurs on coxa I equal or subequal 23

External spur on coxa I longer than internal 19

19(18). Spur on Coxa IV long, thin and directed posteriorly, scutum smooth, ornamented, 2 strong spurs on metatarsi II-IV. Eyes beady, orbited .... _A. parvitarsum_

Spur on coxa IV short, spurs lacking on metatarsi II-IV. Eyes not beady 20

20(19). Marginal groove incomplete terminating at third festoon on each side. Ventral plaques large, coxa I with 2 short, unequal spurs .... _A. longirostre_*

Marginal groove absent 21

21(20). Coxa I with external spur long and thin; internal, short, blunt. Ventrally all festoons except central with a small, pointed tubercle .... _A. naponense_*

Ventral festoons lacking tubercles 22

22(21). Coxa I with 2 very small unequal spurs, external longer of the two. Coxae II-IV with 1 very short spur. Scutum and dorsum of basis ornate, cervical grooves deep, comma-shaped .... _A. scutatum_*

Coxa I with external spur fairly long and thin, internal slightly shorter and stouter. Scutum light brown with dark brown ornamentation. Scutum smooth, punctations small, numerous, evenly scattered .... _A. pacae_*

23(18). Coxa I with 2 long, stout, pincer-shaped spurs. Palpal article II dorsally with a posteriorly directed horn. Palpal article I ventrally bearing a lateral extension. Scutum ornamented with a _J_ in each lateral field. Cornua large .... _A. nodosum_*

Lacking this combination of characters 24

24(23). Spurs on coxa I both long and thin 25

Spurs on coxa I both short or moderately long and broad 26

25(24). Ventrally posterior margin of basis slightly concave. Venter with very few, if any, white hairs .... _A. calcaratum_*

Ventrally posterior margin of basis convex. Venter glabrous or with many white hairs .... _A. striatum_

26(24). Cornua short, stubby 27

Cornua moderately long, broad 29

27(26). Spurs on coxa I very short. Coxae II-III with I short, stubby spur. Small species; length of scutum 2.5 mm. Scutum with roughened appearance (Galapagos Islands) .... _A. darwini_

Without this combination of characters 28

28(27). Large species; length of scutum ca. 7.7 mm, surface quite rough with numerous punctations. One very small, rounded spur on coxae II-III. Ventrally lacking posterointernal tubercles on all festoons .... _A. pictum_

Moderately sized species; length of scutum ca. 4.3 mm, surface smooth, with very few, minute punctations; 1 fairly large triangular spur on coxae II-III. Each festoon, except the median, ventrally with a small posterointernal tubercle .. _A. fulvum_

29(26). Ventral festoons extending beyond posterior margin as translucent tubercles. Ornamentation generally distributed-diffuse, pinkish. Punctations very numerous, quite deep over entire surface. Cornua moderately large .... _A. incisum_*

Ventral festoons not extended. Scutum glabrous centrally with no punctations. Punctations numerous in peripheral areas but absent in restricted areas giving surface a bumpy appearance. Cornua very long .... _A. varium_*

30(1). Trochanters with spurs. Palpal article I with ventral spur 31

Trochanters without spurs 33

---

*Recorded from Venezuela

31(30). Cornua present 32
Cornua absent. Scutum glabrous. Marginal groove continued anteriorly as a series of shallow punctations. Ornamentation indistinct. Coxa I with two widely separated subequal spurs .... *A. pseudoconcolor*

32(31). Cornua small. Coxa I with short, subequal spurs. Scutum glabrous, inornate .... *A. auricularium*°
Cornua large. Coxa I with internal spur much shorter than external. Scutum inornate but punctations give the surface a roughened appearance .... *A. parvum*°

33(30). Metatarsi of legs II-IV with either 1 or 2 spurs 34
Metatarsi of legs II-IV lacking spurs 36

34(33). Two spurs on metatarsi II-IV .... *A. maculatum*°
One spur on metatarsi II-IV 35

35(34). Festoons ventrally with a small tubercle at the posterointernal angle .... *A. triste*
Festoons lacking tubercles .... *A. tigrinum*°

36(33). Scutum with elongate keel-like ridge in posteromedian area .... *A. pecarium*
Scutum without keel-like ridge 37

37(36). Eyes beady, orbited. Species introduced to Western Hemisphere from Africa .... *A. variegatum*
Eyes not beady or orbited 38

38(37). Coxa I with 2 long spurs. Tip of external spur curving slightly outward. Ventral festoons with tubercles extending beyond posterior margin .... *A. ovale*°
Tip of external spur not curving outward 39

39(38). Spurs of coxa I equal or subequal 40
External spur of coxa I longer than internal 43

40(39). Spurs of coxa I slender, acute. Scutum with punctations moderate in number and fine 41
Spurs of coxa I broad and stout. Scutum with punctations numerous 42

41(40). Body broad, oval. Elements of scutal pattern all of about equal intensity. Medium-sized species .... *A. tapirellum*
Body elongate oval, lateral margins subrectilinear. Longitudinal elements of scutal pattern accentuated giving a more striped appearance. Small species .... *A. oblongoguttatum*°

42(40). Ventral festoons extend as translucent tubercles beyond posterior margin of body. Scutal ornamentation as 2 pale orange-purple stripes lateral to scutal midline .... *A. cooperi*°
Body without projecting ventral festoons. Scutal ornamentation as 2 bright red-orange patches in scapular area .... *A. coelebs*°

43(39). Spur on coxa IV long, pointed, directed posteromesially. Scutum smooth with ornamentation. Punctations numerous and small. Venter with white hairs .... *A. americanum*
Spur on coxa IV long or short but not directed posteromesially 44

44(43). Ornate. 45
Inornate. Spur on coxa IV short. Punctations on scutum numerous and shallow .... *A. inornatum*

45(44). Coxae II-IV with a short, triangular spur. Ventral plaques large .... *A. geayi*
Coxa IV with either a long, stout spur or an extremely long, thin spur 46

°Recorded from Venezuela

46(45). Coxa IV with an extremely long, thin spur, palps short. Palpal article II dorsally with a posteriorly directed spur. Scutal ornamentation not extensive ...... *A. neumanni*

Coxa IV with a long, stout spur. Palps long. Palpal article II dorsally lacking a spur. Scutal ornamentation extensive ...... *A. cajennense** *A. imitator*

Males of these two species are not always distinguishable but *A. imitator* tends to be smaller and narrower. The ventral tubercles do not extend as far posteriorly as those of *A. cajennense* (see Kohls, 1958).

Females[3]

1. Coxae II-III with 2 spurs 2

Coxae II-III with one distinct spur or a ridgelike spur 15

2(1). Hypostome 3/3 3

Hypostome 4/4 10

3(2). Scapular area of scutum extends straight laterally. Cervical grooves deep. White pilosity on dorsum of body 4

Scapular area of scutum does not extend straight laterally 5

4(3). Small species. Length from anterior scutal margin to posterior body margin ca. 2.3 mm. Long, white body hairs (Galapagos Islands) ...... *A. williamsi*

Moderately-sized species. Length from anterior scutal margin to posterior body margin ca. 5 mm. Short, white body hairs (Caribbean Islands) ...... *A. torrei*

5(3). Coxa IV with 1 spur 6

Coxa IV with 2 spurs 7

6(5). Scutal punctations large, numerous, deep, evenly scattered. Dorsum of body with short, white hairs ...... *A. cruciferum*

Scutal punctations shallow centrally, more numerous and deeper at periphery. Dorsum of body without short, white hairs ...... *A. dissimile**

7(5). Spurs on coxa I medium or short. Internal spur on coxa IV very small, sometimes absent. Scutal punctations shallow centrally, deeper and more numerous at periphery. Parasites of reptiles and amphibians ...... *A. dissimile**

Lacking above combination of characters 8

8(7). Dorsum of body densely pilose; also scapular hairs present. Scutum with numerous deep punctations (Galapagos Islands) ...... *A. pilosum*

Dorsum of body lacking dense pilosity (not from Galapagos Islands) 9

9(8). Scutum extensively pale yellowish with deep punctations haloed ...... *A. testudinis*

Scutum extensively dark brown. Punctations not haloed ...... *A. rotundatum**

10(2). A small ventral tubercle present on all festoons except the middle one ...... *A. brasiliense*

Ventral tubercles absent on all festoons 11

11(10). Dorsum of body densely pilose ...... *A. extraoculatum**

Dorsum lacking dense pilosity 12

12(11). Scutum much wider than long. Internal spur of coxa IV directed medially ...... *A. tuberculatum*

Scutum longer than wide or approximately as long as wide. Internal spur of coxa IV directed posteriorly 13

13(12). Very large species. Scutum about 4 mm wide. Hypostome often 4½/4½. Spurs of coxae II-IV connected by a salient sharp-edged ridge ...... *A. crassum**

Smaller species. Hypostome 4/4. Spurs of coxae II-IV separated 14

*Recorded from Venezuela

[3] The female of *A. fulvum* is unknown.

14(13). Internal spurs of coxae I-IV diminishing in size .... *A. sabanerae*
Internal spurs of coxae I-IV all approximately the same size .... *A. humerale*

15(1). Hypostome 4/4 16
Hypostome 3/3 21

16(15). Scutum inornate 17
Scutum ornate 18

17(16). Scutum greater than 3 mm wide with numerous shallow punctations evenly distributed, cervical grooves converging, then slightly diverging as wide, shallow, punctate depressions .... *A. pictum*
Scutum less than 3 mm wide with punctations deeper and more numerous centrally, fewer on lateral margins. Cervical grooves minute, shallow, comma-shaped 19

18(16). Coxa IV with definite obvious spur .... *A. goeldii*
Coxa IV with a slight, thickened ridge, wider than long. Coxa I with 2 large subequal spurs, the external curved mesially .... *A. multipunctum*°

19(18). Eyes large, slightly bulbous. Cervical grooves very deep and converging, then diverging almost to posterolateral margins. Deep punctations over entire scutum. Ornamentation extensive, tip of spur on coxa IV broadly rounded .... *A. incisum*°
Without this combination of characters 20

20(19). Festoons, except the central one, with a small tubercle at the posterointernal angle. Scutal ornamentation primarily consisting of a spot in the posterior angle. With a definite ventral spur on palpal article I. Tip of spur on coxa IV sharply pointed .... *A. scalpturatum*°
Scutal ornamentation more extensive. Lacking tubercles on festoons. Lacking a definite ventral spur on palpal article I .... *A. varium*°

21(15). Coxa I with 1 spur only or 1 spur and an indication of an additional spur 22
Coxa I with 2 definite spurs 23

22(21). Scutum ivory-colored except around eyes. Punctations moderate in number, shallow. Conspicuous pale bulbous elevation anterolateral to spur .... *A. antillorum*
Scutum light-colored but with dark areas more extensive. Punctations numerous, deep, and pitlike in scapular areas. Bulbous elevation reduced anterolateral to spur .... *A. albopictum*

23(21). Trochanters with spurs 24
Trochanters without spurs 26

24(23). Scutum distinctly ornamented, broadly rounded with a somewhat sinuous posterolateral margin .... *A. pseudoconcolor*
Scutum not ornamented, posterolateral margin not sinuous 25

25(24). Scutum brown, lateral margins elevated, depressed cervical fields. Punctations obvious, moderately deep. Very small triangular spur on coxae II-IV .... *A. parvum*°
Scutum smooth, glabrous, pale yellowsh with brown spot at each eye. Punctations minute, indistinct. Moderately large, triangular spur on coxae II-IV .... *A. auricularium*°

26(23). Eyes orbited, bulging 27
Eyes not orbited, flat 28

27(26). Scutum very punctate especially in lateral areas. Metatarsi II-IV without spurs (introduced from Africa) .... *A. variegatum*
Scutum lightly punctate. Metatarsi II-IV each with 2 large spurs .... *A. parvitarsum*

°Recorded from Venezuela

28(26). Metatarsi of legs II-IV with either 1 or 2 spurs 29
Metatarsi of legs II-IV lacking spurs 31

29(28). Metatarsi II-IV with 2 spurs .... *A. maculatum**
Metatarsi II-IV with 1 spur 30

30(29). Festoons ventrally with a tubercle at the posterointernal angle .... *A. triste*
Festoons without tubercles .... *A. tigrinum**

31(28). White hairs obvious and extensive on dorsum of body, palps short 32
Dorsum of body glabrous or only a few fine white hairs present, palps long or short 33

32(31). Coxa I with external spur long, internal spur short .... *A. neumanni*
Coxa I with both spurs very short (Galapagos Islands) .... *A. darwini*

33(31). Large species. Hypostome very long and sharply pointed. Scutum longer than wide, indistinctly ornate. Legs, especially IV, inordinately long .... *A. longirostre**
Lacking this combination of characters 34

34(33). Coxa I with external spur much longer than internal 35
Coxa I with spurs equal or subequal 41

35(34). Scutum ornate 36
Scutum inornate .... *A. inornatum*

36(35). Coxae II and III with broad flat ridgelike spur much wider than long 37
Coxae II and III with spurs as broad as long or slightly broader than long 39

37(36). Tubercles present at posterointernal angles of festoons 38
Tubercles lacking at posterointernal angles of festoons .... *A. imitator*

38(37). Palpal segment 2 about 2½ times as long as segment 3. Festoons ventrally somewhat rugose and poorly defined, first 4 on each side of the median each with a well-developed tubercle at the posterointernal angle. Internal spur of coxa I broad, blunt .... *A. pecarium*
Palpal segment 2 about twice as long as segment 3. Festoons ventrally smooth, clearly defined; each, except the median, with a much smaller tubercle at the posterointernal angle. Internal spur of coxa I narrower and more sharply pointed .... *A. cajennense**

39(36). Large species, coxa I with both spurs short, flat; internal spur very small .... *A. geayi*
Medium-sized species; external spur slender, long 40

40(39). Internal spur of coxa I short, blunt, stout. Scutum with extensive ornamentation .... *A. naponense**
Internal spur of coxa I short, thin, acute. Scutal ornamentation usually restricted to a spot at the posterior angle .... *A. americanum*

41(34). Spurs of coxa I short 42
Spurs of coxa I moderately long or very long 43

42(41). Spurs of coxae II-III broad ridges. Spur of coxa IV broadly rounded. Scutum lightly punctate .... *A. cooperi**
Spurs of coxae II-IV short, triangular. Scutum densely punctate .... *A. scutatum**

43(41). Scutal ornamentation consisting of a pale spot at the posterior angle and a Y-shaped figure in each lateral field. Palps heavy and rugose, segment 2 with an oblique ridge dorsally .... *A. nodosum**
Lacking this combination of characters 44

*Recorded from Venezuela

44(43). Coxa I with long spurs, the external curved slightly outward at its tip .... *A. ovale*°
Coxa I with apical portion of external spur not curved 45

45(44). Coxa I with slender spurs 46
Coxa I with stout spurs 48

46(45). Scutum as long as broad, extensively copper-colored. Cervical grooves shallow. Very long, slender spurs on coxa I .... *A. striatum*
Scutum broader than long. Cervical grooves deep 47

47(46). Genital apron overlaid on each side posterolaterally by a conspicuous, blunt, flattened projection darker than the apron and adjacent integument. Punctations not limited to anterior half of scutum .... *A. tapirellum*
Genital apron overlaid on each side with an inconspicuous, long, slender projection. Punctations very scant on posterior half of scutum .... *A. oblongoguttatum*°

48(45). Coxa I with external spur longer than internal. Scutum indistinctly ornate or inornate .... *A. pacae*°
Coxa I with spurs equal in length 49

49(48). Scutum with extensive pale ornamentation. Palpal article I ventrally with a large, elongate, flattened plate .... *A. coelebs*°
Scutal ornamentation usually an irregular, pale spot in the posterior angle and in each posterolateral field. Palpal article I ventrally lacking a large, flattened plate .... *A. calcaratum*°

°Recorded from Venezuela

Amblyomma auricularium (Conil, 1878)

Ixodes auricularius Conil, 1878:99.

Amblyomma concolor Neumann, 1899.

Amblyomma auricularium (Conil), Lahille, 1905.

Amblyomma curruca Schulze, 1936.

MATERIAL EXAMINED

APURE: 3 ♂♂, 3♀♀ from 1 *Dasypus sabanicola*, 38 km NNW Pto. Paez, Río Cinaruco, 76 m elev., 28.I.66, M. D. and A. L. Tuttle; 1 ♀, data as above; 1 ♂, data as above, except from *Cerdocyon thous*.

BOLÍVAR: 1 ♀ from *Tamandua longicaudata*, 306 m elev., 146 km S, 7 km E Ciudad Bolívar, Hato San José, 6.III.67, N. E. Peterson, et al.; 4 ♂♂, same data, except 324 m elev., 10.III.67.

CARABOBO: 1 ♀ from *Dasypus novemcinctus*, Montalbán, Potrerito, 1091 m elev., 22.XI.67, A. L. Tuttle.

FALCÓN: 9 ♂♂ from 1 *Tamandua longicaudata*, 13 km N, 13 km E Mirimire, nr. La Pastora, ± 75 m elev., 16.XI.67, N. E. Peterson, et al.

LARA: 1 ♂ from *Dasypus novemcinctus*, 10 km N El Tocuyo, Caserio Boro, 537 m elev., 21.VII.68, A. L. Tuttle.

MIRANDA: 27 ♂♂, 5 ♀♀, 1 N, 7 LL from 1 *Dasypus novemcinctus*, 27 km W Caracas, Tácata, 366 m elev., 17.XII.67, N. E. Peterson, et al.

MONAGAS: 69 ♂♂, 46 ♀♀, 3 NN from 7 *Dasypus novemcinctus*, 54 km SE Maturin, Mata de Bejuco, 18 m elev., 6-10.VI.68, A. L. Tuttle; 1 ♂ from *Conepatus semistriatus*, locality as above except 47 km SE, 36 m elev., 2.VIII.66, A. L. and M. D. Tuttle; 8 ♂♂ from 1 *Galictis vittatus*, 54 km SE Maturín, Mata de Bejuco, 18 m elev., 10.VI.68, A. L. Tuttle; 5 ♂♂ from 1 *Dasypus novemcinctus*, 47 km SE Maturín, Mata de Bejuco, 36 m elev., 8.VIII.66, A. L. and M. D. Tuttle.

TRUJILLO: 1 ♂ from *Cerdocyon thous*, 23 km NW Valera, nr. Agua Santa, 90 m elev., 15.X.65, N. E. Peterson.

DISTRIBUTION AND HOSTS

Amblyomma auricularium is commonly found on armadillos, although it has been taken on a variety of other mammals, including marsupials (Vogelsang and Santos Dias, 1953*b*; Fairchild, et al., 1966).

This species was first reported in this country by Aragão (1936). It occurs in various provinces throughout Venezuela and ranges from Mexico to Argentina.

Amblyomma beaurepairei Vogelsang and Santos Dias, 1953

Amblyomma beaurepairei Vogelsang and Santos Dias, 1953*a*:40.

This species was described from 1 male (holotype) and 1 female (allotype) and 1 female obtained on an armadillo (*Tatus novemcinctum* = *Dasypus novemcinctus*) captured at Turiamo, Aragua, Venezuela. No further reports of this species have been recorded and the type material could not be obtained for study. However a comparison of the figures given by Vogelsang and Santos Dias with other *Amblyomma* from Venezuela indicates this species may be valid. These authors indicate that *A. beaurepairei* is morphologically close to *A. auricularium, A. pseudoconcolor* and *A. cooperi.* Therefore, this species should be given consideration when specimens are identified to any one of these three species.

Amblyomma cajennense (Fabricius, 1787)

Acarus cajennensis Fabricius, 1787:372.

Ixodes cajennensis Fabricius, 1794.

Ixodes cajennensis Fabricius, 1805.

Amblyomma tenellum Koch, 1844.

Amblyomma mixtum Koch, 1844.

Amblyomma sculptum Berlese, 1888.

Amblyomma parviscutatum Neumann, 1899.

Amblyomma versicolor Nuttall and Warburton, 1908.

Amblyomma tapiri Tonelli-Rondelli, 1937.

Amblyomma finitimum Tonelli-Rondelli, 1937.

Material Examined

Apure: 1 ♀ from *Hydrochaeris hydrochoeris*, 38 km NNW Pto. Paez, Río Cinaruco, 76 m elev., 11.I.66, A. L. and M. D. Tuttle; 2 ♂♂ from 1 *Cerdocyon thous*, 3.5 km NE Nula, La Chiricoa, 2.II.68, A. L. Tuttle; 1 ♀ from *Tapirus terrestris*, 3 km N Nula, Nulita, II.68, A. L. Tuttle; 1 ♂ from *Tayassu pecari*, locality as above, 12.II.68, A. L. Tuttle.

Bolívar: 242 ♂♂, 55 ♀♀ from 10 *Tayassu pecari*, 56 km SE El Manteco, Río Supamo, 150 m elev., 2.IV-4.V.66, A. L. and M. D. Tuttle; 10 ♂♂, 8 ♀♀ from 1 *Tayassu tajacu*, as above, 4.V.66, A. L. and M. D. Tuttle; 2 ♂♂, 3 ♀♀ on field sheet, 56 km SE Manteco, Río Supamo, 150 m elev., 8.IV and 1.IX.66, 30.III.66, A. L. and M. D. Tuttle; 1 ♀ from *Tayassu tajacu*, locality as above, 2.IV.66, A. L. and M. D. Tuttle; 1 ♀ from *Dasyprocta aguti*, locality as above, 20.IV.66, A. L. and M. D. Tuttle; 1 ♂, 6 ♀♀ from 1 *Choeroniscus minor*, 59 km SE El Dorado, Km 74, El Manaco, 150 m elev., 13.VI.66, A. L. and M. D. Tuttle; 15 ♂♂, 10 ♀♀ from 1 *Hydrochaeris hydrochoeris*, 56 km SE El Manteco, Río Supamo, 150 m elev., 17.IV.66, A. L. and M. D. Tuttle; 1 ♂ from *Tapirus terrestris*, 43.2 km NE Icabarú, El Mundo Nuevo de Surukum, 854 m elev., 10.V.68, A. L. Tuttle; 1 ♀ from *Tamandua longicaudata*, 146 kms. 7 km E. Ciudad Bolívar, Hato San José, 306 m elev., 6.III.67, N. E. Peterson, et al.; 11 ♂♂, 7 ♀♀ from 1 *Tayassu pecari*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, 324 m elev., 18.III.67, N. E. Peterson, et al; 7 ♂♂, 5 ♀♀ from 1 *Hydrochaeris hydrochoeris*, locality as above except 297 m elev., 11.III.67, N. E. Peterson, et al.; 122 ♂♂, 28 ♀♀ from 1 *Tapirus terrestris*, locality as above except ca. 350 m elev., 18.III.67, N. E. Peterson, et al. 9 ♂♂, 7 ♀♀ from 2 *Myrmecophaga tridactyla*, locality as above except ca. 309 and 330 m elev., 30.III, 7.IV.67, N. E. Peterson, et al.

Carabobo: 1 ♂ from *Dasyprocta aguti*, 1.7 km NW Montalbán, 1091 m elev., 6.XI.67, A. L. Tuttle; 11 ♂♂, 5 ♀♀ from *Sigmodon hispidus*, Montalbán, Potrerito, 1091 m elev., 7.XI.67, A. L. Tuttle.

Falcón: 1 ♀ from *Alouatta seniculus*, 4 km N, 10 km E Mirimire, nr. La Pastora 250 m elev., 24.XI.67, N. E. Peterson, et al.; 12 ♂♂, 6 ♀♀ from 1 *Tayassu tajacu*, 13 km N, 12 km E Mirimire, nr. La Pastora, 25 m elev., 3.XII.67, N. E. Peterson, et al.; 1 ♀ from *Dasyprocta aguti*, 13 km N, 10 km E Mirimire, nr. La Pastora, 70 m elev., 17.XI.67, N. E. Peterson, et al.; 1 ♂, 1 ♀ from 1 *Tamandua longicaudata*, 13 km N, 13 km E Mirimire, nr. La Pastora, ± 75 m elev., 16.XI.67, N. E. Peterson, et al.; 2 ♂♂, 1 ♀, 60+ NN from 1 *Tamandua longicaudata*, 7 km N, 13 km E Mirimire, nr. La Pastora, 275 m elev., 17.XI.67, N. E. Peterson, et al.; 146 ♂♂, 56 ♀♀, 4 NN, 2 LL from 3 *Tayassu tajacu*, 4 km N, 10 km E Mirimire, nr. La Pastora, ±75 m elev., 12.XI.67, N. E. Peterson, et al.; 200+ ♂♂ and ♀♀, 10 NN, 20+ LL from 1 *Tayassu tajacu*, 10 km N, 11 km E Mirimire, nr. La Pastora, 75 m elev., 21.XI.67, N. E. Peterson, et al.; 310+ ♂♂ and ♀♀, 425+ NN and LL from 1 *Tayassu tajacu*, 10 km N, 13 km E Mirimire, nr. La Pastora, 70 m elev., 25.XI.67, N. E. Peterson, et al.

Guárico: 1 ♂ from *Procyon cancrivorus*, 10 km N Calabozo (Emblase de Guárico), 100 m elev., 22.I.68, N. E. Peterson, et al.

Miranda: 1 ♂ from *Dasypus novemcinctus*, 27 km S, 5 km W Caracas, Tacata, 366 m elev., 17.XII.67, N. E. Peterson, et al.

T. F. Amazonas: 1 ♀ from *Priodontes maximus*, Río Manapiare, San Juan, 155 m elev., 9.VII.67, M. D. Tuttle, F. L. Harder; 3 ♂♂, 5 ♀♀ from 1 *Tapirus terrestris*, 32 km SSE Puerto Ayacucho, Raya, ? elev., 24.IX.67, A. L. Tuttle; 1 ♂ from *Tayassu pecari*, 28 km S Puerto Ayacucho, Guayabal, 135 m elev., 5.X.67, A. L. Tuttle.

Yaracuy: 2 ♂♂ from man, 8 km N, 18 km W San Felipe, Minas de Aroa, 400 m elev., 6.XII.67, N. E. Peterson, et al.

Amblyomma probably *cajennense*

Bolívar: 11 NN from 1 *Hydrochaeris hydrochoeris*, 56 km SE El Manteco, Río Supamo, 150 m elev., 17.IV.66, A. L. and M. D. Tuttle.

Falcón: 5 NN, 13 LL from 1 *Dasyprocta aguti*, 13 km N and 10 km E Mirimire, nr. La Pastora, 70 m elev., 17.XI.67, N. E. Peterson, et al.

Distribution and Hosts

In most areas *Amblyomma cajennense* is commonly reported from domestic animals and less frequently from wild hosts (Fairchild, et al., 1966; Vogelsang and Santos Dias, 1953*a, b*). Collections in the present study probably do not reflect the true host preference of this species in Venezuela because predominantly wild hosts were examined. These records indicate that adult *A. cajennense* will attack a variety of hosts in this area.

A. cajennense was first reported in Venezuela by Neumann (1899). A summary of information available on this species in Venezuela through 1953 is furnished by Vogelsang and Santos Dias (*loc. cit.*).

The species is widely distributed in Venezuela; and its range extends from southern Texas (USA) and islands of the Caribbean to Argentina.

Amblyomma calcaratum Neumann, 1899

Amblyomma calcaratum Neumann, 1899:226.

Material Examined

Apure: 23 ♂♂, 5 ♀♀, 1 N from 2 *Tamandua longicaudata*, 4 km NW Nula, El Milagro, ? elev., 15-20.II.68, A. L. Tuttle.

Dto. Federal: 7 ♂♂ from 1 *Vampyrops oratus* (host in error?), 4 km NNW Caracas, 1465 m elev., 22.VII.65, N. E. Peterson, et al.

T. F. Amazonas: 5 ♂♂ from 1 *Myrmecophaga tridactyla*, Río Cunucunuma, Belén, 150 m elev., 10.I.67., M. D. Tuttle, F. L. Harder; 7 ♂♂, 2 ♀♀ from 1 *Tamandua longicaudata*, 26 km S Puerto Ayacucho, 119 m elev., 11.IX.67, A. L. Tuttle; 1 ♀ from *Tamandua longicaudata*, Tamanaco, 4 km NE San Juan, Río Manapiare, 155 m elev., 11.VII.67, M. D. Tuttle and F. L. Harder.

Zulia: 1 ♂ from *Tamandua tetradactyla*, 39 km WNW Encontrados, El Rosario, 37 m elev., 28.II.68, A. L. Tuttle; 1 ♂ from *Macrophyllum macrophyllum* (host data probably wrong), 56 km WNW Encontrados, 76 m elev., 28.III.68, A. L. Tuttle.

Distribution and Hosts

According to Diaz-Ungria (1957), *A. calcaratum* was first reported from Venezuela by Fiasson (1949). Vogelsang and Santos Dias (1953*a*) also describe and record the presence in this country of a subspecies, *A. calcaratum venezuelensis*, which Santos Dias (1958*a*) considers to be identical with *A. calcaratum leucozomum* Schulze, 1936. In this study all the specimens have been listed as *A. calcaratum* because available information regarding this species is insufficient to determine the validity of described subspecies. In addition to Venezuela, this species has been recorded from French Guiana, Ecuador, Brazil, Bolivia (RML unpublished records), Paraguay, Trinidad, Colombia, Costa Rica, Panama, and British Honduras.

This tick, in the adult stage, is almost restricted to anteaters. Two records listed above from bats are extremely doubtful and need confirmation. Fairchild, et al. (1966) record adults of this species from two nonanteater hosts, i.e., *Choloepus hoffmanni* and *Mazama americana*. In addition, the RML collection contains a single collection from *Procyon cancrivorus* in Brazil.

The RML collection also contains numerous nymphs of *A. calcaratum* taken off birds in Brazil. The identification of these nymphs was accomplished by comparison with cast nymphal skins from which adult *A. calcaratum* had emerged.

Amblyomma coelebs Neumann, 1899

Amblyomma coelebs Neumann, 1899:223.

Amblyomma bispinosum Neumann, 1906.

Material Examined

Bolívar: 2 ♂♂, 3 ♀♀ from 1 *Tapirus terrestris*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, ca. 350 m elev., 18.III.67, N. E. Peterson, et al.; 2 ♂♂, 3 ♀♀ from 1 *Tapirus terrestris*, 43.2 km NE Icabarú, El Mundo Nueva de Surukun, 854 m elev., 10.V.68, A. L. Tuttle; 2 ♀♀ from 1 *Hydrochaeris hydrochoeris*, 56 km SE El Manteco, Río Supamo, 150 m elev., IV.66, A. L. and M. D. Tuttle.

T. F. Amazonas: 4 ♂♂, 4 ♀♀ from 1 *Tapirus terrestris*, Río Cunucunuma, Belén, 150 m elev., 29.I.67, M. D. Tuttle, F. L. Harder; 5 ♂♂, 11 ♀♀ from 1 *Tapirus terrestris*, Casiquiare Canal, Capibara, 130 m elev., 29.V.67, M. D. Tuttle, F. L. Harder; 8 ♂♂ from 1 *Tapirus terrestris*, 32 km SSE Puerto Ayacucho, Raya, ? elev., 25.IX.67, A. L. Tuttle. In addition, the RML collection contains 2 ♂♂, 6 ♀♀ from Tapir, Selva, Gran Sabana, 14.II.38, C. H. Mallou.

Distribution and Hosts

Amblyomma coelebs is most frequently found on tapirs and occasionally is reported from other hosts such as *Hydrochaeris hydrochoeris* (see above), *Agouti paca*, and *Mazama americana* in Panama; (Fairchild, et al., 1966), and *Myrmecophaga tridactyla* in Colombia; (RML unpublished).

Neumann (1906) first recorded the presence of this species in Venezuela when he described *A. bispinosum* (= *A. coelebs.*) Since then this original record has been cited by numerous authors, but to our knowledge no other collections of this species have been reported from Venezuela. The range of *A. coelebs* extends from Mexico to Brazil and northern Argentina.

Amblyomma cooperi
Nuttall and Warburton, 1908

Amblyomma cooperi Nuttall and Warburton, 1908:410.

Amblyomma lutzi Aragão, 1908.

Amblyomma ypsilophorum Schulze, 1941.

This species was not represented in the present collections.

Distribution and Hosts

A. cooperi is a parasite of the capybara (*Hydrochaeris capybara*=*H. hydrochoeris*) and the tapir (*Tapirus americanus*=*T. terrestris*) and was first recorded in Venezuela by Vogelsang and Cordero (1940) from *Hydrochaeris hydrochoeris* at Zaraza, Guarico. It has also been reported from Paraguay, Bolivia, Brazil, and Argentina. The RML collection also contains males, nymphs, and larvae from the capybara, *Hydrochaeris hydrochoeris* from Uruguay.

Amblyomma crassum Robinson, 1926

Amblyomma crassum Robinson, 1926:177.

No specimens were available for study.

Distribution and Hosts

According to Diaz-Ungria (1957), Fiasson (1949) reported *Amblyomma crassum* from *Testudo sculpta* in Venezuela (Fiasson's paper is not available). Mendez Arocha and Ortiz (1957) described the male from Venezuela, although Fairchild, et al. (1966) believed these specimens represented another species, perhaps *sabanerae*. Although we have been unable to authenticate the occurrence of *A. crassum* in Venezuela, its presence is suggested because it has been recorded from Colombia and Peru (Fairchild et al., *loc. cit*).

Amblyomma dissimile Koch, 1844

Amblyomma dissimile Koch, 1844:225.

Amblyomma irroratum Koch, 1844.

Amblyomma adspersum Koch, 1844.

Amblyomma infumatum Koch, 1844.

Ixodes flavidus Koch, 1844.

Ixodes humanus Koch, 1844.

Ixodes pulchellus Lucas, 1846.

Ixodes boarum Stoll, 1886-1893.

Amblyomma deminutivum Neumann, 1899.

Material Examined

Apure: 4 ♂♂, 7 ♀♀, 103+ NN, 3 LL from 1 snake, 6-8 km W Río Sanare on road between El Cantón and Guasdualito, ? elev., 13.II.66, N. E. Peterson; 3 ♂♂ from 1 lizard, 46 km NE Pto. Paez. Hato Cariben, Río Cinaruco, 76 m elev., 4.I.66, A. L. and M. D. Tuttle.

Falcón: 1 N from lizard, Capatárida, 40 m elev., 28.VI.68, A. L. Tuttle.

Guárico: 1 ♀, 3 NN, 7 LL from squamata, 7 km S, 5 km E Calabozo Biological Station, 100 m elev., 21.VIII.68, N. E. Peterson, J. Matson.

Miranda: 7 ♂♂ from 1 iguana, S of Río Chico, Hda. Pedogal, 1 m elev., 4.XI.66, N. E. Peterson, et al.; 4 ♂♂, 2 ♀♀, 4 NN from 1 snake, area around Río Chico, 1 m elev., 4.XI.66, N. E. Peterson, et al.

Monagas: 3 ♂♂, from 1 rattlesnake, 54 km SE Maturin, Mata de Bejuco, 18 m elev., 10.VI.68, A. L. Tuttle.

Nueva Esparta: 1 ♂ from snake, 3 km N, 1 km E La Asuncion, Salamanca. 60 m elev., 18.I.67, N .E. Peterson, et al.; 2 ♂♂ from 1 snake, nr. area 2 km S, 10 km W La Asuncíon nr. Boquerón, 305 m elev., 20.I.67, N. E. Peterson, et al.; 7 ♂♂, 1 ♀. 1 N from 1 snake, 2 km N and 2 km E La Asuncíon, Cerro Matasiete, 182 m elev.. 27.I.67, N. E. Peterson, et al.

Sucre: 8 ♂♂, 2 ♀♀, 1 N from 2 toads, 7 km N, 5 km E Güiria, Ensenada Cauranta, 4 m elev., 7.VI.67, N. E. Peterson, et al.; 2 ♂♂, 1 ♀, 6 NN from 1 iguana, locality as above, 10.VI.67, N. E. Peterson, et al.; 14 ♂♂, 1 ♀, 2 NN from 1 *Boa*, 2 km E Cumaná, 5 m elev., 30.XII.66, N. E. Peterson, et al.

Trujillo: 15 ♂♂, 3 ♀♀, 9 NN from 1 *Boa constrictor*, 23 km NW Valera, Agua Santa, 90 m elev., 2.X.65, N. E. Peterson; 3 ♂♂ from 1 iguana, Valle Verde, nr. Santa Apolonia, 46 km WNW Valera. 29 m elev., 29.X.65, N. E. Peterson; 4 ♂♂ from 1 *Bufo*, locality as above except 52 km, 1.XI.65, N. E. Peterson; 1 ♂, 1 N, 13 LL from 1 "Taequ," 23 km NW Valera, Agua Santa, 120 m elev., 20.X.65, N. E. Peterson; 4 ♂♂, 2 ♀♀ from 1 iguana, Valle Verde, nr. Santa Apolonia, 46 km WNW Valera, 29 m elev.. 29.X.65, N. E. Peterson; 1 ♀, 17 NN, 2 LL from 1 lizard, as above but 52 km, 1.XI.65, N. E. Peterson; 2 ♂♂, 1 ♀ from 1 lizard, 28 km NW Valera, nr. El Dividive, 90 m elev., 13.IX.65, N. E. Peterson.

Yaracuy and Carabobo: 23 ♂♂, 4 NN, 1 L from 1 *Procchimys semispinosus*, (host in error?) 19 km NW Urama, Km 40, 5-25 m elev., 15.X.65, A. L. and M. D. Tuttle.

Zulia: 5 NN, 38 LL from 1 lizard, 18 km N, 49 km W Maracaibo, Hda. Platanal, 75 m elev., 11.VI.68, N. E. Peterson, J. Matson; 1 ♂, 3 ♀♀, 1 N from 2 lizards, 10 km S, 18 km W Machiques, Kasmera, 250-270 m elev.. 15.IV.68, N. E. Peterson, et al.

Distribution and Hosts

Amblyomma dissimile was first reported by Neumann (1899). It is obviously common on reptiles throughout Venezuela. Vogelsang and Santos Dias (1953*a*) and Diaz-Ungria (1957) also provided additional information on this species. *A. dissimile* ranges from Florida, Mexico, and the West Indies to Argentina.

Amblyomma extraoculatum Neumann, 1899

Amblyomma extraoculatum Neumann, 1899:274.

Amblyomma romitii Tonelli-Rondelli, 1939.

Amblyomma tasquei Floch and Abonnenc, 1940.

Material Examined

Bolívar: 2 ♂♂, 1 ♀, 1 N from 1 *Hydrochaeris hydrochoeris*. 56 km SE El Monteco, Río Supamo, 150 m elev., 17.IV.66, A. L. and M. D. Tuttle; 163 ♂♂, 80 ♀♀. 170 NN from 1 *Hydrochaeris hydrochoeris*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, 297 m elev., 11.III.67. N. E. Peterson, et al.; 1 ♂ from *Didelphis marsupialis*, data as above except 324 m elev., 16.III.67, N. E. Peterson, et al.

Monagas: 6 ♂♂, 8 ♀♀, 40 NN from 2 *Hydrochaeris hydrochoeris*, 54 km SE Maturín, Mata de Bejuco. 18 m elev., 8.VI.68, A. L. Tuttle.

Amblyomma probably *extraoculatum*

Monagas: 2 LL from *Hydrochaeris hydrochoeris*, 54 km SE Maturin. Mata de Bejuco, 18 m elev., 8.VI.68, A. L. Tuttle.

Distribution and Hosts

Amblyomma extraoculatum was described by Neumann, 1899 from a female specimen supposedly from Singapore. Santos Dias (1955) maintains that the Asiatic origin of this species is probably in error because this species is identical to *A. romitii* Tonelli-Rondelli, 1939 and *A. tasquei*, which were described from capybaras in British Guiana and French Guiana, respectively. The RML collection also includes two lots of this tick from *Hydrochaeris hydrochoeris* from Dutch Guiana (unpublished data). Our records appear to be first for *A. extraoculatum* from Venezuela.

Amblyomma guianense Neumann, 1907

Amblyomma guianense Neumann, 1907:96.

No specimens were available for study.

Distribution and Hosts

According to Diaz-Ungria (1957) Mendez Arocha identified *Amblyomma guianense* species from a pig in Venezuela. To our knowledge this constitutes the first and only record of this species in Venezuela. This species was described from Surinam (Dutch Guiana), so its occurrence in Venezuela is not surprising. This species resembles *A. multipunctum* with which it should be compared for possible synonymy when more material is available.

Amblyomma incisum Neumann, 1906

Amblyomma incisum Neumann, 1906:206

Amblyomma superbrasiliense Schulze, 1941.

Matebial Examined

Bolívar: 10 ♂♂ from 1 *Tapirus terrestris*, 43.2 km NE Icabarú, El Mundo Nuevo de Surukun, 854 m elev., 10.V.68, A. L. Tuttle.

T. F. Amazonas: 4 ♂♂ from 1 *Tapirus terrestris*, 84 km SSE Esmeralda, Boca Mavaca, Río Orinoco, 138 m elev., 20.III.67, M. D. Tuttle, F. L. Harder; 1 ♀ from *Tapirus terrestris*, Río Cunucunuma, Belén, 150 m elev., 29.I.67, M. D. Tuttle, F. L. Harder; 16 ♂♂, 28 ♀♀ from 1 *Tapirus terrestris*, Casiquiare Canal, Capibara, 130 m elev., 29.V.67, M. D. Tuttle, F. L. Harder: 2 ♂♂, 6 ♀♀ from 1 *Tapirus terrestris*, 32 km SSE Puerto Ayacucho, Raya, ? elev., 24.IX.67, A. L. Tuttle.

Distribution and Hosts

A. incisum is primarily a parasite of tapirs. However, deer, agouti, and man also have been reported as hosts for this species.

It has been reported from French Guiana, Ecuador, and Brazil. The RML collection contains specimens from Peru, British Guiana, Paraguay, and Venezuela. Our records are apparently the first of this species from Venezuela.

Amblyomma longirostre (Koch, 1844)

Haemalastor longirostris Koch, 1844:223.

Haemalastor crassitarsus Karsch, 1880.

Hyalomma crassitarsus Neumann, 1899.

Hyalomma longirostre Neumann, 1901.

Amblyomma giganteum Neumann, 1899.

Amblyomma avicola Neumann, 1899.

Amblyomma avecolens Cooley and Kohls, 1944.

Material Examined

Apure: 3 ♂♂, 1 ♀ from 1 *Coendou prehensilis*, 3 km N Nula, Nulita, ? elev., 15.II.68, A. L. Tuttle.

Falcón: 7 ♂♂, 1 ♀ from 1 *Coendou prehensilis*, nr. Mirimire, ± 250 m elev., 5.X.67, N. E. Peterson, et al.

Miranda: 1 N from *Artibeus lituratus*, 19 km E Caracas, Curapao, 1160 m elev., 8.X.66, N. E. Peterson, et al.

Monagas: 3 ♂♂ from 1 *Coendou prehensilis*, 3 km N, 4 km W Caripe nr. San Agustín, 1200 m elev., 28.VI.67, N. E. Peterson, et al.; 6 ♂♂, 1 ♀ from 1 *Coendou prehensilis*, nr. San Agustín, 1200+ m elev., 7.VII.67, N. E. Peterson, et al.

Zulia: 3 ♂♂ from 1 *Coendou prehensilis*, 58 km WNW Encontrados, El Rosario, 54 m elev., 27.II.68, A. L. Tuttle; 3 ♂♂, 1 ♀, 1 N from 1 *Coendou prehensilis*, 18 km N, 49 km W Maracaibo, Hda. planatal, 75 m elev., 8.VI.68, N. E. Peterson, J. Matson; 1 N from *Sciurus granatensis*, 3 km S, 19 km W Machiques, Novito, 1165 m elev., 3.V.68, N. E. Peterson, et al.

Amblyomma probably *longirostre*

Barinas: 1 L from *Sciurus granatensis*, nr. Altamira, El Filo, ? elev., 21.VII.67, A. L. Tuttle.

Distribution and Hosts

Adults of *Amblyomma longirostre* are primarily found on porcupines. Occasionally adults are found on *Cebus* monkeys and man (RML records). Nymphs feed on *Artibeus* and *Sciurus* (see above), and have been reported from a variety of birds throughout its range in Central and South America and as far north in the United States as Butler, Pa. (RML unpublished). This species has been known in Venezuela since 1880 when Karsch described *Haemalastor crassitarsus* (=*A. longirostre*). Since that time, it has been reported from this country by numerous authors (Vogelsang and Santos Dias, 1953*a*). The known breeding range of *A. longirostre* apparently extends from Panama to Brazil.

Amblyomma maculatum Koch, 1844

Amblyomma maculatum Koch, 1844:227.

Amblyomma rubripes Koch, 1844.

Amblyomma complanatum Berlese, 1888.

Material Examined

Monagas: 1 ♂, 1 ♀ from 2 horses, 3 km N, 4 km W Caripe, San Agustín, 1180 m elev., 7.VII.67, N. E. Peterson, et al.; 1 ♀ from *Cerdocyon thous*, 54 km SE Maturín, Mata de Bejuco, 3.VI.68, A. L. Tuttle.

Distribution and Hosts

Adults of this species feed on a variety of wild and domestic animals. The immature stages attack birds, and also are found on smaller wild mammals.

A. maculatum was first reported in Venezuela by Vogelsang and Cordero (1940) from carnivores and swine from the State of Guarico. Vogelsang and Santos Dias (1953*a*) gave additional distribution and host data for this species in Venezuela. The range of this species extends from southern United States to Colombia and Venezuela (Kohls, 1958).

Amblyomma multipunctum Neumann, 1899

Amblyomma multipunctum Neumann, 1899:226.

No Venezuelan specimens were available for study.

Distribution and Hosts

Neumann (1899) described this species from "North America" from *Tapirus* sp. and *Dicranocerus furcatus*. Then in 1911 he added Venezuela as the country of origin. This information has been repeated by several authors (Robinson, 1926; Pinto, 1930; Vogelsang and Santos Dias, 1953*a*).

Amblyomma naponense (Packard, 1869)

Ixodes naponensis Packard, 1869:65.

Amblyomma mantiquirense Aragão, 1908.

Material Examined

Apure: 17 ♂♂, 3 ♀♀ from 3 *Tayassu tajacu*, 4 km NW Nula, El Milagro, ? elev., 11-12.II.68, A. L. Tuttle; 9 ♂♂ from 1 *Tayassu pecari*, as above, 12.II.68, A. L. Tuttle.

Bolívar: 65 ♂♂, 12 ♀♀ from 7 *Tayassu pecari*, 56 km SE El Monteco, Río Supamo, 150 m elev., 2.IV, 4.V.66. A. L. and M. D. Tuttle; 12 ♂♂, 12 ♀♀ from 1 *Tayassu tajacu*, as above, 4.V.66, A. L. and M. D. Tuttle; 12 ♂♂, 3 ♀♀ from 1 *Tayassu pecari*, as above but 48 km SE, 2.IV.66, A. L. and M. D. Tuttle; 2 ♂♂, 1 ♀ off 1 *Tayassu tajacu*, data as above, 2.IV.66, A. L. and M. D. Tuttle; 1 ♂, 1 ♀ from 1 *Tayassu pecari*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, 18.III.67, N. E. Peterson, et al.

Falcón: 1 ♂ from *Agouti paca*, 5 km N, 13 km E Mirimire, nr. La Pastora, 143 m elev., 23.XI.67, N. E. Peterson, et al.

T. F. Amazonas: 6 ♂♂, 5 ♀♀ from 1 *Tayassu tajacu*, 84 km SSE Esmeralda, Boca Mavaca, 138 m elev., 3.III.67, M. D. Tuttle, F. L. Harder; 7 ♂♂, 10 ♀♀, 18 NN, from 1 *Tayassu tajacu*, 4 km NE San Juan, Río Manapiare, 155 m elev., 7.VII.67, M. D. Tuttle, F. L. Harder; 2 ♂♂, 7 ♀♀ from 1 *Tayassu pecari*, 28 km S Puerto Ayacucho, Guayabal, 135 m elev., 11.X.67, A. L. Tuttle.

Distribution and Hosts

Records for *Amblyomma naponense* indicate collared anteaters (*Tamandua*) or collared peccaries (*Tayassu*) are predominant hosts; however, other medium-sized animals are occasionally parasitized.

Apparently this is the first record of this species from Venezuela. *A. naponense* has also been reported from Panama, British and French Guiana, Brazil, Peru, and Colombia (see Fairchild, et al., 1966). In addition, the RML (Bishopp Collection) contains a lot collected in Paramaribo, Dutch Guiana.

Amblyomma nodosum Neumann, 1899

Amblyomma nodosum Neumann, 1899:224.

Amblyomma uncatum Nuttall and Warburton, 1908.

Material Examined

Bolívar: 16 ♂♂, 4 ♀♀ from 2 *Tamandua longicaudata*, 146 km S and 7 km E Ciudad Bolívar, Hato San José, 297-300 m elev., 10.III, 10.IV.67, N. E. Peterson, et al.; 2 ♂♂ from 2 *Myrmecophaga tridactyla*, locality as above except 309-330 m elev., 30.III, 7.IV.67, N. E. Peterson, et al.

Carabobo: 5 ♂♂, 1 ♀ from 1 *Tamandua longicaudata*, 9 km NE Montalbán, Cumbre Canoabo, 1245 m elev., 13.XI.67, A. L. Tuttle.

Monagas: 16 ♂♂, 10 ♀♀ from 2 *Tamandua longicaudata*, 54 km SE Maturín, Mata de Bejuco, 18 m elev., 6.VI.68, A. L. Tuttle; 12 ♂♂, 1 ♀ from 3 *Tamandua longicaudata*, data as above except 5-9.VI.68, A. L. Tuttle.

T. F. Amazonas: 1 ♂ from *Tamandua longicaudata*, Río Cunucunuma, Belén, 150 m elev., 14.II.67, M. D. Tuttle, F. L. Harder.

Distribution and Hosts

To our knowledge, only anteaters are parasitized by adults of *Amblyomma nodosum*.

A. nodosum was first reported from Venezuela by Vogelsang and Santos Dias (1953*a*) and also has been reported from Costa Rica, Panama, Guatemala, Colombia, Nicaragua, and Brazil. In addition, the RML collection contains 2 lots of this tick from anteaters in Bolivia and 4 lots containing 1 tick each from birds of Trinidad.

Amblyomma oblongoguttatum Koch, 1844

Amblyomma oblongoguttatum Koch, 1844:228.

Amblyomma vittatum Neumann, 1899.

Amblyomma darlingi Nuttall, 1912.

Material Examined

Apure: 1 ♂ from *Homo sapiens*, 3 km N Nula, San Camilo, Nulita, ? elev., I.68, A. L. Tuttle.

Barinas: 1 ♂ from *Tayassu tajacu*, Altamira, San Pedro, ? elev., 21.XII.67, A. L. Tuttle.

Bolívar: 6 ♂♂, 1 ♀ from 4 *Tayassu pecari*, 56 km SE El Manteco, Río Supamo, 150 m elev., 18.IV-4.V.66, A. L. and M. D. Tuttle; 1 ♂ from *Tayassu tajaco*, data as above except, 4.V.66; 1 ♀ from *Hydrochaeris hydrochoeris*, as above, 17.IV.66, A. L. and M. D. Tuttle; 1 ♂, 1 ♀ from 1 *Tayassu pecari*, data as above except 48 km SE, 2.IV.66, A. L. and M. D. Tuttle; 1 ♀ from *Tayassu pecari*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, 324 m elev., 18.III.67, N. E. Peterson, et al.; 6 ♂♂, 5 ♀♀ off 1 *Tapirus terrestris*, as above except ca. 350 m elev., 18.III.67, N. E. Peterson, et al.; 2 ♂♂ from 2 *Tapirus terrestris*, 43.2 km NE Icabarú, El Mundo Nueva de Surukun, 854 m elev., 10.V.67, A. L. Tuttle.

T. F. Amazonas: 1 ♂ from *Tapirus terrestris*, 84 km SSE Esmeralda, Boca Mavaca, Río Orinoco, 138 m elev., 20.III.67, M. D. Tuttle, F. L. Harder, 2 ♂♂, 2 ♀♀ from 1 *Tapirus terrestris*, 35 km SSE Puerto Ayacucho, Raya, ? elev., 24.IX.67, A. L. Tuttle; 1 ♂ from *Tayassu pecari*, 28 km S Puerto Ayacucho, Guayabal, 135 m elev., 5.X.67, A. L. Tuttle.

In addition to the above records, the RML collection contains several males and females from tapir, Selva, Gran Sabana, 14.II.38, C. H. Ballou and 1 ♂ from man, east slope of Mt. Marahuaca, 10.IV.50, J. Maldonado Capriles.

Distribution and Hosts

Amblyomma oblongoguttatum attacks a variety of hosts wherever it occurs (Fairchild, et al., 1966). It ranges from Mexico to Brazil and Bolivia. To our knowledge, ours are the first reports of this species from Venezuela.

Amblyomma ovale Koch, 1844

Amblyomma ovale Koch, 1844:227.

Amblyomma confine Koch, 1844.

Amblyomma auronitens Berlese, 1888.

Amblyomma fossum Neumann, 1899.

Amblyomma quasistriatum Tonelli-Rondelli, 1937.

Amblyomma ovale kriegi Schulze, 1941.

Synonymy according to Aragão and Fonseca, 1961.

Material Examined

Apure: 5 ♀♀ from 2 *Cerdocyon thous*, 3 km N Nula, San Camilo, Nulita, 24 m elev., 22-24.I.68, A. L. Tuttle; 2 ♂♂, 2 ♀♀ on people at camp, as above, I.68, A. L. Tuttle; 3 ♂♂, 1 ♀, 1 N from 1 *Eira barbara*, 3 km N Nula, Nulita, ? elev., 14.II.68, A. L. Tuttle; 1 ♀ from *Cerdocyon thous*, 3.5 km NE Nula, La Chiricoa, ? elev., 2.II.68, A. L. Tuttle.

Barinas: 2 NN from 1 *Procchimys semispinosus*, 2 km SW Altamira, La Vega del Río, Santo Domingo, ? elev., 26.XII.67, A. L. Tuttle; 1 ♂, 1 ♀ from 1 *Eira barbara*, Altamira, ? elev., 29.XII.67, A. L. Tuttle.

Bolívar: 3 ♂♂ from 1 *Tapirus terrestris*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, ca. 350 m elev., 18.III.67, N. E. Peterson, et al.; 2 ♂♂, 2 ♀♀ from 1 *Tapirus terrestris*, NE Icabarú, El Mundo Nuevo de Surukun, 854 m elev., 10.V.68, A. L. Tuttle; 1 N from *Proechimys guyannensis*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, 306 m elev., 5.IV.67, N. E. Peterson, et al.; 1 N from *Proechimys guyannensis*, 28 km NE Icabarú, Cinco Rancho, 775 m elev., 26.IV.68, A. L. Tuttle.

Carabobo: 1 ♂ from *Cerdocyon thous*, 5 km SSE Montalbán, Araguita, 1091 m elev., 5.XI.67, A. L. Tuttle; 1 N from *Proechimys semispinosus*, 1.7 km NNW Montalbán, Montero, 1091 m elev., 7.XI.67, A. L. Tuttle; 1 N from *Holochilus brasiliensis*, 4.5 km SE Montalbán, Sabana Aguirre, 1055 m elev., 4.XI.67, A. L. Tuttle.

Falcón: 1 N from *Proechimys semispinosus*, 20 km S, 98 km E Maracaibo, Hda. Socopito, 470 m elev., 29.V.68, N. E. Peterson, et al.

Miranda: 8 NN from 4 *Zygodontomys brevicauda*, 6 km S Río Chico, Hacienda La Guapa, 1 m elev., 14.XI.66, N. E. Peterson, et al.; 1 ♂, 1 ♀ from 1 *Procyon cancrivorus*, nr. Río Chico, 1 m elev., 17.XI.66, N. E. Peterson, et al.

Sucre: 1 N from *Heteromys anomalus*, 5 km S, 25 km E Carúpano, Manacal, 425 m elev., 20.VII.67, N. E. Peterson; 1 N from *Zygodontomys brevicauda*, as above except 410 elev., 21.VII.67, N. E. Peterson, et al.

T. F. Amazonas: 2 NN from 1 *Proechimys guyannensis*, Río Cunucunuma, Belén, 150 m elev., 17.I.67, M. D. Tuttle, F. L. Harder; 4 ♂♂, 3 ♀♀ from 1 *Tapirus terrestris*, 84 km SSE Esmeralda, Boca Mavaca, Río Orinoco, 138 m elev., 20.III.67, M. D. Tuttle, F. L. Harder; 18 ♂♂, 6 ♀♀ from 1 *Felis onca*, Río Cunucunuma, Belén, 150 m elev., 3.I.67, M. D. Tuttle, F. L. Harder; 1 ♂ from *Homo sapiens*, as above, 5.I.67, M. D. Tuttle, F. L. Harder; 1 ♂, 4 ♀♀ from 1 *Tapirus terrestris*, as above, 29.I.67, M. D. Tuttle, F. L. Harder; 18 ♂♂, 7 ♀♀ from 1 *Tapirus terrestris*, Casiquiare Canal, Capibara, 135 m elev., 29.V.67, M. D. Tuttle, F. L. Harder; 40 ♂♂, 10 ♀♀ from 1 *Tapirus terrestris*, 32 km SSE Puerto Ayacucho, Raya, ? elev., 24.IX.67, A. L. Tuttle; 1 ♀ from *Cerdocyon thous*, 26 km S Puerto Ayacucho, 119 m elev., 27.IX.67, A. L. Tuttle.

Yaracuy and Carabobo: 2 ♀♀ from 1 *Conepatus semistriatus*, 19 km NW Urama, Km 40, 525 m elev., 18.X.65, A. L. and M. D. Tuttle.

Zulia: LL and NN from 1 *Procchimys canicollis*, 18 km N and 51 km W Maracaibo, Hda. Rodeo, 80 m elev., 8.VI.68, N. E. Peterson, J. Matson.

Amblyomma probably *ovale*

Miranda: 5 LL from 1 *Zygodontomys brevicaudata*, 6 km S Río Chico, Hacienda La Guapa, 1 m elev., 14.XI.66, N. E. Peterson, et al.

Trujillo: 1 N from *Oryzomys concolor*, 10 km WNW Valera, nr. Isnotu, 930 m elev., 28.VIII.65, N. E. Peterson.

Distribution and Hosts

In considering the host and distribution data for *Amblyomma ovale* we are following Aragão and Fonseca (1961) who consider *A. aureolatum* (Pallas, 1772) (= *striatum*, Koch 1844) to be a distinct species.

A. ovale attacks a variety of mammals as evidenced by the above records and information in the literature (Aragão and Fonseca 1961; Fairchild, et al., 1966). Based on available records it appears that immature stages are primarily parasites of rodents.

This species was first reported in Venezuela by Vogelsang and Cordero (1940). It ranges from Mexico to Argentina.

Amblyomma pacae Aragão, 1911

Amblyomma pacae Aragão, 1911:170.

Amblyomma fiebrigi Robinson, 1911.

Amblyomma nigrum Tonelli-Rondelli, 1939.

Material Examined

Barinas: 1 N from *Proechimys semispinosus*, 1 km S Altamira, ? elev., 5.I.68, A. L. Tuttle.

Falcón: 1 ♂ from *Agouti paca*, 5 km N, 13 km E Mirimire, nr. La Pastora, 143 m elev., 23.XI.67, N. E. Peterson, et al.

Miranda: 1 ♀ from *Agouti paca*, 2 km S El Guapo, ca. 400 m elev., 19.XI.66, N. E. Peterson, et al.

T. F. Amazonas: 2 ♂♂, 1 ♀ from 1 *Agouti paca*, Río Cunucunuma, Belén, 150 m elev., 20.I.67, M. D. Tuttle, F. L. Harder, 8 ♂♂, 2 ♀♀ from 1 *Agouti paca*, 84 km SSE Esmeralda, Boca Mavaca, 138 m elev., 8.III.67, M. D. Tuttle, F. L. Harder; 1 ♂, 4 NN from *Agouti paca*, 32 km SSE Puerto Ayacucho, Raya, 135 m elev., 3.X.67, A. L. Tuttle.

Zulia: 1 ♂, 2 ♀♀ from 2 *Agouti paca*, 45 km WNW Encontrados, El Rosario, 37 m elev., 23-24.III.68, A. L. Tuttle; 1 ♀ from *Agouti paca*, data as above except 39 km WNW, 7.III.68, A. L. Tuttle; 1 ♀ from *Tamandua tetradactyla*, 45 km WNW Encontrados, El Rosario, 37 m elev., 22.III.68, A. L. Tuttle.

Distribution and Hosts

Adults of *Amblyomma pacae* are frequently found on *Agouti paca* and several other mammals throughout its range.

The above records are the first for Venezuela. *A. pacae* has also ben reported from Panama, British Honduras, Brazil, Paraguay, and Colombia. The RML collection contains 1 male found biting man at Paloemeu Airstrip, Tapanahoni River, Surinam, IVC.61 H. A. Beatty.

Amblyomma parvum Aragão, 1908

Amblyomma parvum Aragão, 1908:18-19.

Material Examined

Dto. Federal: 1 ♀ from *Carollia brevicauda*, 4 km N Caracas, 1465 m elev., 21.VII.65, N. E. Peterson, et al.

Guárico: 2 ♂♂, 1 ♀, 29 NN, 25 LL from 2 *Sylvilagus floridanus*, 16 km NW Barhacoas, nr. Hda. Los Marmones, 228 m elev., 2-3.III.66, N. E. Peterson, et al.; 2 ♂♂, 4 ♀♀ from 1 *Procyon cancrivorus*, 10 km N Calabozo, Embalse de Guarico, 100 m elev., 22.I.68, N. E. Peterson, et al.

Distribution and Hosts

A. parvum has been reported from a variety of mammalian hosts (Fairchild, et al., 1966). The record from a bat cited above is questionable.

It was first reported in Venezuela by Diaz-Ungria (1957) from San Juan de los Morros (Guárico), Margarita El Yaque on the Island of Margarita, and Mantecal (Apure). In addition to Venezuela, this species has been reported from Mexico, Guatemala, Panama, French Guiana, Brazil, and Argentina.

Amblyomma rotundatum Koch, 1844

Amblyomma rotundatum Koch, 1844:229.

Amblyomma agamum Aragão, 1912.

Amblyomma goeldii Neumann, 1899 (pro parte) (according to Floch and Fauran, 1958).

Material Examined

Bolivar: 1 ♀ off *Choeroniscus minor*, 59 km SE El Dorado, Km 74, El Manaco, 150 m elev., 13.VI.66, A. L. and M. D. Tuttle.

In addition, the RML collection contains 2 ♀♀ off *Bufo marinus*, San Fernando de Atabapo, Rio Orinoco, T. . Amazonas, 9.VI.50, J. M. Capriles.

Distribution and Hosts

Amblyomma rotundatum is almost exclusively a parasite of cold-blooded animals according to Floch and Fauran, 1958, who also list this species from *Dasypus novemcinctus;* however, they call attention to the unusual host record. The above record from a bat is also unusual and requires confirmation.

It was first reported in Venezuela by Vogelsang (1936) and ranges from Mexico to Argentina. Because of the close similarity of females (males are unknown as the species is parthenogenic) of this species to *A. dissimile*, some confusion exists relative to its distribution (Kohls, 1969). The RML collection contains verified examples of *A. rotundatum* from Mexico, Guatemala, Panama, Costa Rica, Jamaica, Colombia, Peru, Bolivia, Grenada, Guadeloupe, Dutch Guiana, Martinique, Trinidad, and Brazil.

Amblyomma scalpturatum Neumann, 1966

Amblyomma scalpturatum Neumann, 1906:203.

Amblyomma brasiliense var. *guianense* Floch and Abonnenc, 1941.

Amblyomma myrmecophagium Schulze, 1933.

Amblyomma beccari Tonelli-Rondelli, 1939.

Amblyomma latepunctatum Tonelli - Rondelli, 1939.

Material Examined

Bolívar: 2 ♂♂, 3 ♀♀ from 1 *Tapirus terrestris*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, ca. 350 m elev., 18.III.67, N. E. Peterson, et al.; 1 ♂ off *Myrmecophaga tridactyla*, as above except ca. 330 m elev., 30.III.67, N. E. Peterson, et al.; 5 ♂♂, 1 ♀ from 1 *Tapirus terrestris*, 43.2 km NE Icabarú, El Mundo Nuevo de Surukun, 854 m elev., 10.V.68, A. L. Tuttle.

T. F. Amazonas: 2 ♂♂, 1 ♀ from 1 *Tapirus terrestris*, Río Cunucunuma, Belén, 150 m elev., 29.I.67, M. D. Tuttle, F. L. Harder; 5♂♂ from 1 *Myrmecophaga tridactyla*, data as above, 10.I.67, M. D. Tuttle, F. L. Harder; 11 ♂♂, 8 ♀♀ from 1 *Tapirus terrestris*, Casiquiare Canal, Capibara, 130 m elev., 29.V.67, M. D. Tuttle, F. L. Harder; 1 ♂, 5 ♀♀ from 1 *Tapirus terrestris*, 32 km SSE Puerto Ayacucho, Raya, ? elev., 24.IX.67, A. L. Tuttle.

In addition, the RML collection contains also the following collections: 3 ♂♂, 2 ♀♀ from vegetation, Camp Culebra, Northern Slope of Cerro Duida, 14.IV.50, J. M. Capriles; 2 ♂♂, 1 ♀ from tapir and sloth, Santa Lucia de Surucún (approx. 35 mi NE Icabarú), Bolívar, 12.V.68, C. E. Yunker.

Distribution and Hosts

Amblyomma scalpturatum is commonly found on tapirs and rarely on anteaters and dogs.

To our knowledge, the above records constitute the first evidence for this species in Venezuela. It has also been reported from French Guiana, Dutch Guiana, British Guiana, Bolivia and Brazil (Floch and Fauran, 1958). In addition, the RML collection contains a lot from Peru and one from Colombia, off tapirs.

Amblyomma scutatum Neumann, 1899

Amblyomma scutatum Neumann, 1899:237.

Amblyomma boneti Hoffmann, 1946.

No specimens from Venezuela were available for study.

Distribution and Hosts

According to Diaz-Ungria (1957) Fiasson (1949) recorded this species in Venezuela from *Myrmecophaga tridactyla* and *Drimarchon c. corais*. Diaz-Ungria (loc. cit.) also cite new host records based on identifications by Mendez as follows: *Boa c. constrictor* from Barrancas (State of Monagas); *Ameiva ameiva* and *Iguana iguana* from the island of Margarita.

It has been reported from reptiles in Mexico, Guatemala, Paraguay and Brazil. In addition, the RML collection contains specimens from Honduras, Nicaragua, Costa Rica, and El Salvador.

Amblyomma tigrinum Koch, 1844

Amblyomma tigrinum Koch, 1844:227.

Amblyomma ovatum Koch, 1844.

Amblyomma bouthieri Senevet, 1940.

Material Examined

Apure: 8 ♂♂, 2 ♀♀ from 2 *Cerdocyon thous*, 38 km NNW Pto. Paez, Río Cinaruco, 76 m elev., 28.I.66, A. L. and M. D. Tuttle.

Bolívar: 39 ♂♂, 11 ♀♀ from 2 *Cerdocyon thous*, 144-145 km S, 6-8 km E Ciudad Bolívar, nr. Hato San José, 309 m elev., 20-21.III.67. N. E. Peterson, et al.; 2 ♂♂, 13 ♀♀. 21 NN from 1 *Oryzomys fulvescens*, as above, 21.III.67, N. E. Peterson, et al.; 1 ♂ from *Hydrochaeris hydrochoeris*, 146 km S and 7 km E Ciudad Bolívar, nr. Hato San José, 279 m elev., 11.III.67, N. E. Peterson, et al.; 3 ♂♂. 1 ♀ from 1 *Cerdocyon thous*, as above except 297 m elev., 13.III.67, N. E. Peterson, et al.; 1 ♂. 3 ♀♀ from 1 *Cerdocyon thous*, 135 km S and 6 km E Ciudad Bolívar, nr. Hato San José. 305 m elev., 29.III.67, N. E. Peterson, et al.; 1 ♂ from *Cerdocyon thous*, as above except 146 km S, 7 km E. 300 m. elev., 30.III.67, N. E. Peterson; 1 ♂, 2 ♀♀ from 1 *Cerdocyon thous*, 56 km NE Icabarú, Descanso, 905 m elev., 14.V.68, A. L. Tuttle.

Carabobo: 2 ♀♀ from 1 *Cerdocyon thous*, 3 km SW Montalbán, Hacienda La Cañada, 1111 m elev., 21.XI.67, A. L. Tuttle.

Falcón: 2 NN from 1 *Cerdocyon thous*, 10 km N, 11 km E Mirimire, nr. La Pastora, 60 m elev., 23.XI.67, N. E. Peterson, et al.

T. F. Amazonas: 14 ♂♂, 7 ♀♀ from 4 *Cerdocyon thous*, 26 km S Puerto Ayacucho, 119 m elev., 27.IX.67, A. L. Tuttle.

Distribution and Hosts

Amblyomma tigrinum is mainly a parasite of wild and domestic carnivores and rarely attacks other hosts (Floch and Fauran, 1958).

This is the first report of this species from Venezuela. It has also been recorded from French Guiana, Brazil, Peru, Argentina, and Paraguay. In addition, the RML collection now contains 1 lot from Chile, 5 lots from Bolivia, and 3 lots from Uruguay.

Amblyomma varium Koch, 1844

Amblyomma varium Koch, 1844:224.

Amblyomma gertschi Cooley and Kohls, 1942.

No material was collected in the current survey. However, the RML collection contains 1 ♂, 1 ♀ from *Bradypus tridactylus* (= *B. infuscatus*) Rancho Grande, 3500 m elev., 5.V.45, William Beebe.

Distribution and Hosts

The only other record of *Amblyomma varium* from Venezuela is that of Vogelsang and Cordero (1940) from *Bradypus tridactylus* (= *B. infuscatus*) in the states of Aragua and Carabobo. The preferred hosts for this species are *Bradypus* sp. and *Choloepus* sp. It has been reported from Brazil, Nicaragua, Panama, Colombia, the Guianas, Argentina, Chile, Costa Rica, and Peru (Fairchild, et al., 1966). The

RML collection also contains a single lot from Guatemala.

Amblyomma spp.

The number of immature *Amblyommas* that are unidentifiable emphasizes a basic problem in the study of South American ticks. Life histories of most species are unknown and few have been reared in the laboratory. Confusion has been compounded by the fact that the larvae and nymphs are often taken on different hosts. A great contribution to the knowledge concerning ticks of this area could be accomplished by basic laboratory and field studies of their life history.

Material Examined

Apure: 29 NN, 212 LL were found on the following hosts: *Agouti paca, Cebus nigrivittatus, Cerdocyon thous, Coendou prehensilis, Dasyprocta* sp., *Echimys semivillosus, Hydrochaeris hydrochoeris, Homo sapiens, Mazama americana, Proechimys semispinosus, Tayassu pecari,* and *T. tajacu.*

Aragua: 3 NN, 2 LL were found on *Akodon urichi* and *Myotis keaysi.*

Barinas: 23 NN, 177 LL were found on the following hosts: *Proechimys semispinosus, Sciurus granatensis, Sigmodon hispidus, Tayassu tajacu,* and *Uroderma bilobatum.*

Bolívar: 784 NN, 460 LL were found on the following hosts: *Agouti paca* bird, *Carollia perspicillata, Cerdocyon thous, Cebus albifrons, Didelphis* sp., *D. marsupialis, Dasypus* sp., *Dasypus kappleri, Dasyprocta aguti, Holochilus brasiliensis, Homo sapiens, Hydrochaeris, hydrochoeris, Lutreolina crassicaudata,* lizard, *Myrmecophaga tridactyla, Mazama americana, M. gouazoubira, Monodelphis brevicaudata, Marmosa cinerea, M. murina, Neacomys tenuipes, Nectomys squamipes, Nasua nasua, Noctilio labialis, Odocoileus virginianus, Oryzomys* sp., *O. fulvescens, O. concolor, Proechimys guyannensis, P. hoplomyoides, Pithecia pithecia, Philander opossum, Rhipidomys macconnelli, Sciurus igniventris, Sturnira lilium, S. tildae, Sylvilagus brasiliensis, Tapirus terrestris, Tayassu pecari, T. tajacu,* and *Zygodontomys brevicauda.*

Carabobo: 5 NN, 19 LL were found on the following hosts: *Glossophaga soricina, Monodelphis brevicaudata, Oryzomys fulvescens,* and *Sigmodon hispidus.*

Dto. Federal: 32 NN, 81 LL were found on the following hosts: *Akodon urichi, Carollia brevicauda, Eptesicus montosus, Felis pardalis,* and *Glossophaga longirostris.*

Falcón: 311 NN, 183 LL were found on the following hosts: *Agouti paca, Alouatta seniculus, Cerdocyon thous, Dasyprocta aguti, Didelphis marsupialis, Glossophaga soricina, Heteromys anomalus, Homo sapiens,* lizard, *Mazama americana, M. gouazoubira, Monodelphis brevicaudata, Odocoileus virginianus, Oryzomys concolor, Proechimys semispinosus, Saccopteryx bilineata, Sigmodon hispidus, Tamandua longicaudata, Tayassu tajcu,* and *Zygodontomys brevicauda.*

Guárico: 46 NN, 14 LL were found on the following hosts: *Artibeus jamaicensis, Heteromys anomalus, Marmosa robinsoni, Monodelphis brevicaudata, squamata, Sylvilagus floridanus, and Zygodontomys brevicauda.*

Lara: 3 LL were found on *Sigmodon hispidus.*

Miranda: 19 NN, 60 LL were found on the following hosts: bird, *Bradypus infuscatus,* lizard, *Monodelphis brevicaudata, Sciurus granatensis, Vampyrops helleri,* and *Zygodontomys brevicauda.*

Monagas: 17 NN, 17 LL were found on the following hosts: *Dasypus novemcinctus, Didelphis marsupialis, Felis yagouroundi, Galictis vittatus, Holochilus brasiliensis, Oryzomys fulvescens, Sigmomys alstoni, Sylvilagus floridanus, Tamandua longicaudata,* and *Zygodontomys brevicauda.*

Nueva Esparta: 3 NN, 9 LL were found on the following hosts: *Homo sapiens, lizard, Marmosa robinsoni,* snake, and *Sylvilagus floridanus.*

Sucre: 44 NN, 92 LL were found on the following hosts: *Didelphis marsupialis,* lizard, *Marmosa robinsoni, Oryzomys bicolor, Proechimys semispinosus, Pteronotus parnellii, Rattus rattus, Heteromys anomalus,* and *Zygodontomys brevicauda.*

T. F. Amazonas: 166 NN, 453 LL were found on the following hosts: *Agouti paca, Bassaricyon gabbi, Callicebus torquatus, Cerdocyon thous, Chiroptes satanas, Dasyprocta fuliginosa, Didelphis marsupialis, Echimys armatus, Hydrochaeris hydrochoeris, Isothrix bistriata, Mazama americana, Molossops planirostris, Molossus ater, Myoprocta pratti, Oryzomys concolor, Philander opossum, Proechimys semispinosus, Pithecia pithecia, Sciurus igniventris, S. gilvigularis, Tayassu pecari, Tamandua longicaudata,* and *Tapirus terrestris.*

Trujillo: 86 NN, 103 LL were found on the following hosts: *Ameiva* sp., *Artibeus jamaicensis, A. lituratus, Carollia perspicillata, Cerdocyon thous, Desmodus rotundus, Didelphis marsupialis, Heteromys anomalus, Iguana* sp., lizard, *Metachirus nudicaudatus, Monodelphis brevicaudata, Proechimys semispinosus,* and *Zygodontomys brevicauda.*

Yaracuy: 5 NN, 11 LL were found on the following hosts: *Chiroderma villosum, Chironectes minimus, Felis pardalis, Marmosa robinsoni, Noctilio labialis, Oryzomys fulvescens, Proechimys semispinosus, Uroderma bilobatum,* and *Zygodontomys brevicauda.*

Yaracuy and Carabobo: 2 NN, 2 LL were found on the following hosts, *Carollia perspicillata* and *Proechimys semispinosus.*

Zulia: 241 NN, 124 LL were found on the following hosts: *Agouti* sp., *Agouti paca, Aotus trivirgatus, Artibeus jamaicensis,* bird, *Cebus albifrons, Cerdocyon thous, Conepatus semistriatus, Dasyprocta variegata, Dasypus novemcinctus, Eira barbara,* lizard, *Metachirus nudicaudatus, Oryzomys capito, Proechimys canicollis, P. semispinosus, Sciurus granatensis, Sigmodon hispidus, Tamandua tetradactyla,* and *Zygodontomys brevicauda.*

Genus *Anocentor* Schulze, 1937

Anocentor nitens (Neumann, 1897)

Dermacentor nitens Neumann, 1897:376.

Anocentor columbianus Schulze, 1937.

Otocentor nitens Cooley, 1938.

Material Examined

Bolívar: 1♀, 1 N from 1 *Cerdocyon thous,* 146 km S, 7 km E Ciudad Bolívar, Hato San José, 300 m elev., 30.III.67, N. E. Peterson, et al.

Monagas: 3 ♂♂, 3 ♀♀, 4 NN, 10 LL from 3 horses, 3 km N, 4 km W Caripe, San Agustín, 1180 m elev., 7.VII.67, N. E. Peterson, et al.

Distribution and Hosts

The only known species of *Anocentor*, "tropical horse tick," is largely confined to domestic animals.

Neumann (1901:267) first recorded *A. nitens* in Venezuela. Vogelsang and Santos Dias (1935*b*) reported this species from capybara at La Caimana, Guárico, Venezuela, and Santos Dias (1958*b*) examined 11 males, 12 females, and 2 nymphs from a wild horse, La Borguera, Venezuela (in the Pasteur Institute collection).

A. nitens is exclusively a New World tick and is confined to the warmer climates. Its distribution extends from southern Texas and Florida, throughout the West Indies and Central America, southward to Bolivia and Brazil (Leite and Ferreira, 1966).

Genus *Boophilus* Curtice, 1891

Boophilus microplus (Canestrini, 1887)

Haemaphysalis micropla Canestrini, 1887:104.

Rhipicephalus micropla Canestrini, 1890.

Rhipicephalus annulatus var. *caudatus* Neumann, 1897.

Rhipicephalus australis Fuller, 1899.

Boophilus australis Stiles and Hassall, 1901.

Boophilus annulatus var. *microplus* Neumann, 1901.

Margaropus micropla Neumann, 1911.

Margaropus annulatus australis Hooker, Bishopp, and Wood, 1912.

Uroboophilus fallax Minning, 1934.

Uroboophilus krijgsmani Minning, 1934.

Uroboophilus rotundiscutatus Minning, 1934.

Uroboophilus cyclops Minning, 1934.

Boophilus calcaratus hispanicus Minning, 1935.

Boophilus annulatus microplus Travis, 1941.

Material Examined

Apure: 1 ♂ from *Cerdocyon thous*, 3 km N Nula, San Camilo, Nulita, 24 m elev., 22.I.68, A. L. Tuttle.

Bolívar: 3 ♂♂, 6 ♀♀, 2 NN from 1 *Odocoileus virginianus*, 146 km S, 7 km E Ciudad Bolívar, Hato San José, ca. 330 m elev., 16.III.67, N. E. Peterson, et al.; 2 NN from 1 *Cerdocyon thous*, as above, 300 m elev., 30.III.67, N. E. Peterson, et al.

Falcón: 7 ♀♀ from 1 *Tayassu tajacu*, 8 km N, 13 km E Mirimire, nr. La Pastora, 60 m elev., 2.XII.67, N. E. Peterson, et al.; 1 ♀ from *Odocoileus virginianus*, 7 km N, 11 km E Mirimire, nr. La Pastora, 50 m elev., 26.XI.67, N. E. Peterson, et al.; 1 ♂, 6 NN from 1 *Mazama gouazoubira*, as above except +75 m elev., 15.XI.67, N. E. Peterson, et al.; 1 ♀, 3 NN from 1 *Odocoileus virginianus*, as above, except 9 km N, 12 km E, 19.XI.67, N. E. Peterson, et al.

Monagas: 2 ♀♀ from a horse, 3 km N, 4 km W Caripe, San Agustin, 1180 m elev., 7.VII.67, N. E. Peterson, et al.

Tachira: 2 ♂♂, 1 ♀, 15 NN from 1 *Carollia perspicillata* (host in error?), 45 km N, 6 km E San Cristóbal, Las Mesas, 460 m elev., 10.II.68, N. E. Peterson, *et al.*

Trujillo: 1 L from *Sturnira lilium*, 23 km NW Valera, near Agua Santa, 90 m elev., 16.VIII.65, N. E. Peterson.

Distribution and Hosts

Vogelsang and Santos Dias (1953*a*) stated that Pinto (1930) was first to report *Boophilus microplus* from Venezuela, although there are at least two earlier references (Rivas, 1919; Reyne, 1923). Minning (1934) recorded this species from cattle in Venezuela. Vogelsang and Cordero (1940) found it frequently on cattle in the states of Aragua, Carabobo, Guárico, and Lara. Vogelsang and Santos Dias (1953*b*) discussed collections from Sabana de Piedra, Monagas; San Carlos, Cojedes; and Kavanayen Gran Sabana, Bolívar (all from *Bos taurus*); and Santos Dias (1958*b*) recorded a collection in the Pasteur Institute from Guárico, Venezuela.

B. microplus is primarily a cattle ectoparasite although it is also found on horses, sheep, goats, and many other wild and domestic animals.

This species has the widest distribution of any species of the genus. Its range includes Mexico, Central and South America, East and South Africa, Madagascar, Australia, and much of the southern half of Asia.

Genus *Haemaphysalis* Koch, 1844

Haemaphysalis juxtakochi Cooley, 1946

Haemaphysalis juxtakochi Cooley, 1946:48.

Haemaphysalis kochi Aragão, 1908.

Haemaphysalis kohlsi Aragão and Fonseca, 1951.

Material Examined

Bolívar: 5 NN from 2 *Dasyprocta aguti*, 56 km SE El Manteco, Río Supamo, 150 m elev., 2-10.IV.66, A. L. and M. D. Tuttle; 25 ♂♂, 8 ♀♀, 2 NN from 2 *Mazama americana*, as above, 14,17.IV.66. A. L. and M. D. Tuttle; 2 ♂♂, 3 ♀♀ from 1 *Tapirus terrestris*, 146 km S and 7 km E Ciudad Bolívar, Hato San José, ca. 350 m elev., 18.III.67, N. E. Peterson, et al.; 1 ♂, 2 ♀♀ from 1 *Mazama americana*, as above except 306 m elev., 8.IV.67, N. E. Peterson, et al.; 2 NN from human, Pauji, NE Icabarú, 9.V.68, C. E. Yunker; 1 N, 2 LL from 1 *Dasyprocta aguti*, 43.2 km NE Icabarú, El Mundo de Surukun, 854 m elev., 4.V.68, A. L. Tuttle; 1 ♀ from *Mazama gouazoubira*, Icabarú, 473 m elev., 13.V.68, A. L. Tuttle; 1 N from *Mazama gouazoubira*, 51.2 km NE Icabarú, Campo Grande, 976 m elev., 9.V.68, A. L. Tuttle; 2 NN from 1 *Dasyprocta aguti*, 45 km NE Icabarú, Santa Lucía de Surukun, 851 m elev., 12.V.68, A. L. Tuttle; 8 ♂♂, 1 ♀ from 1 *Tapirus terrestris*, 43.2 km NE Icabarú, El Mundo Nuevo de Surukun, 854 m elev., 10.V.68, A. L. Tuttle.

Falcón: 1 ♀, 2 LL from 1 *Mazama americana*, 4 km N, 11 km E Mirimire, nr. La Pastora, 240 m elev., 14.XI.67, N. E. Peterson, et al.

Nueva Esparta: 3 ♀♀ from 1 *Sylvilagus floridanus*, 3 km N, 1 km E La Asuncíon, nr. Salamanca, 50 m elev., 18.I.67, N. E. Peterson, et al.

Táchira: 1 ♂, 1 ♀ from 1 *Carollia perspicillata* (host in error?), 45 km N, 6 km E San Cristóbal, Las Mesas, 460 m elev., 10.II.68, N. E. Peterson, et al.

T. F. Amazonas: 1 N from *Sciurus aestuans*, 68 km SE Esmeralda, Boca Mavaca, Río Orinoco, 138 m elev., 16.III.67, M. D. Tuttle and F. L. Harder; 26 ♂♂, 2 ♀♀ from 1 *Tapirus terrestris*, as above, 20.III.67, M. D. Tuttle, F. L. Harder; 6 LL from 1 *Sciurus igniventris*, as above, 12.III.67, M. D. Tuttle, F. L. Harder; 6 NN, 31 LL from *Dasyprocta fuliginosa* Río Manapiare, San Juan, 155 m elev., 7.VII.67, M. D. Tuttle, F. L. Harder; 1 N, 2 LL from 1 *Dasyprocta fuliginosa*, nr. Moracoy, about 10 mi. down Río Manapiare from San Juan, 155 m elev., 10.VII.67, M. D. Tuttle, F. L. Harder; 3 ♀♀, 1 ♂, 2 NN from 1 *Mazama americana*, Río Manapiare, W side, above Moracoy, 155 m elev., 13.VII.67, M. D. Tuttle, F. L. Harder; 6 NN, 1 L from 1 *Tayassu tajacu*, Tamanaco, 4 km NE San Juan, Río Manapiare, 155 m elev., 7.VII.67, M. D. Tuttle, F. L. Harder; 5 ♂♂, 2 ♀♀ from 1 *Mazama americana*, Río Manapiare, San Juan, 155 m elev., 26.VII.67, M. D. Tuttle, F. L. Harder; 1 ♀ from *Tapirus terrestris*, 15 km SSE Puerto Ayacucho, Raya, elev. ?, 25.IX.67, A. L. Tuttle; 1 ♂ from *Cebus nigrivittatus*, Río Manapiare, San Juan, 155 m elev., 26.VII.67, M. D. Tuttle, F. L. Harder; 2 NN from 1 *Dasyprocta fuliginosa*, Río Manapiare, San Juan, 155 m elev., 10.VII.67, M. D. Tuttle, F. L. Harder.

Distribution and Hosts

Haemaphysalis juxtakochi was first reported under the name *H. kochi* from Venezuela by Vogelsang and Cordero (1940) from *Mazama* sp. and *Odocoileus* sp. Cooley (1946) recorded it from a tapir collected at Selva, Gran Sabana, Venezuela. In addition, *H. juxtakochi* has been recorded from Mexico, Panama, Brazil, Colombia, Uruguay, Argentina, and Trinidad. The RML collection contains specimens from Bolivia and Surinam.

Preferred hosts for adults of *H. juxtakochi* appear to be species of deer although it is also found on rodents, perissodactyls, and rarely on lagomorphs and primates.

Haemaphysalis leporispalustris (Packard, 1869)

Ixodes leporis-palustris Packard, 1869:67.

Gonixodes rostralis Dugès, 1888.

Rhipistoma leporis Osborn, 1896.

Haemaphysalis leporis Neumann, 1897.

Haemaphysalis proxima Aragão, 1909.

Haemaphysalis leporis var. *proxima* Aragão, 1911.

Material Examined

Falcón: 10 ♂♂, 11 ♀♀, 10 NN, 2 LL from 2 *Sylvilagus floridanus*, 49 km N, 34 km W Coro, Moruy, 55 m elev., 15.VII.68, N. E. Peterson, J. Matson.

Nueva Esparta: 2 ♂♂, 2 ♀♀, 16 NN, 29 LL from 4 *Sylvilagus floridanus*, 3 km N, 1 km E La Asunción, nr. Salamanca, 50-60 m elev., 18-20.I.67, N. E. Peterson, et al.; 1 ♂, 2 NN from 1 *Sylvilagus floridanus*, 35 km W Porlamar, nr. Boca del Rio, 10 m elev., 30.I.67, N. E. Peterson, et al.

Distribution and Hosts

Vogelsang and Santos Dias (1953*b*) reported the first collection of *H. leporispalustris* from Venezuela, Caicara del Orinoco, Bolívar, from *Oryctolagus* sp. Kohls (1960) recorded a collection of 2 males and 1 female from *Sylvilagus floridanus valenciae* collected in the state of Aragua.

The common rabbit tick ranges widely from Alaska and Canada throughout the United States southward to Argentina and has recently been recorded from the Caribbean area (Kohls, 1969). *H. leporispalustris* in the adult stage is very common on members of the family Leporidae although not restricted to this group. Immature stages may be found on a variety of small mammals and commonly on birds.

Haemaphysalis sp. (mouth parts missing)

Material Examined

T. F. Amazonas: 1 N from *Dasyprocta fuliginosa*, Río Manapiare, San Juan, 155 m elev., 21.VII.67, M. D. Tuttle, F. L. Harder.

Genus *Ixodes* Latreille, 1795

Ixodes auritulus group

Material Examined

Mérida: 5 LL from 1 *Scytalopus* sp., 5.5 km E, 1 km S Tabay, nr. Middle Refugio, 2640 m elev., 16.IV.66, N. E. Peterson; 1 L from *Oryzomys minutus*, as above, 2630 m elev., 14.IV.66, N. E. Peterson; 2 LL from 1 *Thomasomys lugens*, as above, 2710 m elev., 15.IV.66, N. E. Peterson.

Trujillo: 2 LL from 1 bird, 15 km E Trujillo, Hda. Misisí, 2360 m elev., 20.I.66, N. E. Peterson; 1 L from *Oryzomys albigularis*, as above except 14 km E, 2215 m elev., 26.I.66, N. E. Peterson; 1 L from *Thomasomys lugens*, as above, 2225 m elev., 27.I.66, N. E. Peterson.

Distribution and Hosts

Arthur (1960) has called attention to the morphological variation present in ticks ascribed to the *Ixodes auritulus* group. All of the above specimens are similar morphologically; but, in the absence of nymphal or adult stages, definite assignment of this material to *I. auritulus* has not been attempted.

This is the first report of *Ixodes auritulus* group from Venezuela. It has been reported from a variety of seabirds in North, Central, and South America by Cooley and Kohls (1945) and Australian Antarctica and New Zealand by Arthur (1960). Central and South American countries where it occurs include Costa Rica, Guatemala, Peru, Argentina, Brazil, and Chile.

Occurrence of larvae of this species group on mammals as indicated above is unusual and requires verification.

Ixodes (*Exopalpiger*) *jonesae*
Kohls, Sonenshine, and Clifford, 1969

Ixodes jonesae Kohls, Sonenshine, and Clifford, 1969:447.

Material Examined

Mérida: 1 ♀ holotype, 34 LL paratypes from 1 *Thomasomys laniger*, 4 km S, 6.5 km E Tabay, La Coromoto, 3170 m elev., 12.III.66, N. E. Peterson; 1 ♂ allotype from *Thomasomys laniger*, as above, 11.III.66, N. E. Peterson; the folowing are all paratypes, 1 ♀, 2 NN, 14 LL from 9 *Thomasomys laniger*, as above, 3170-3180 m elev., 11-16.III.66, N. E. Peterson; 1 ♀, 1 L (paratypes) from 1 *Oryzomys minutus*, as above, 13.III.66, N. E. Peterson; 1 L from *Oryzomys minutus*, as above, 3180 m elev., 18.III.66, N. E. Peterson;5 NN from 3 *Thomasomys laniger*. 3-4 km W Timotes, nr. Paramito, 3147, 3206 and 3230 m elev., 14-16.II.66, N. E. Peterson; 1 L (not paratype) from *Thomasomys laniger*, 4 km S, 6.5 km E Tabay, La Coromoto, 3185 m elev., 15.III.66, N. E. Peterson.

Táchira: 25+ L from 1 *Caenolestes obscurus*, 35 km S, 22 km W San Cristóbal, Buena Vista, 8.III.68, N. E. Peterson, et al.

Distribution and Hosts

This species of *Exopalpiger* is known only from the opossum, *Caenolestes*, and from rodents, *Thomasomys* and *Oryzomys* species in the states of Mérida and Táchira, Venezuela.

Ixodes (*Ixodes*) *lasallei*
Mendez Arocha and Ortiz, 1958

Ixodes lasallei Mendez Arocha and Ortiz, 1958:198.

Material Examined

Apure: 1 ♀ from *Agouti paca*, 4 km NW Nula, El Milagro, ? elev., 13.II.68, A. L. Tuttle.

Falcón: 1 ♀ from *Agouti paca*, 5 km N, 13 km E Mirimire, nr. La Pastora, 143 m elev., 23.XI.67, N. E. Peterson, et al.

T. F. Amazonas: 1 ♀ from *Agouti paca*, 84 km SSE Esmeralda, Boca Mavaca, 138 m elev., 8.III.67, M. D. Tuttle, F. L. Harder; 7 ♀♀ from 1 *Agouti paca*, 84 km SSE Esmeralda, 10 km up Río Mavaca from its mouth, 138 m elev., 16.III.67, M. D. Tuttle, F. L. Harder; 1 ♂ from *Agouti paca*, Río Cunucunuma, Belén, 150 m elev., 20.I.67, M. D. Tuttle, F. L. Harder; 1 ♀ from *Dasyprocta fuliginosa*, as above, 23.I.67, M. D. Tuttle, F. L. Harder; 1 N from *Philander opossum*, as above, 29.I.67, M. D. Tuttle, F. L. Harder; 3 ♀♀ from 1 *Agouti paca*, 108 km SE Esmeralda, Río Mavaca, 140 m elev., 12.IV.67, M. D. Tuttle, F. L. Harder; 1 ♀ from *Felis pardalis*, 32 km SSE Puerto Ayacucho, Raya, 135 m elev., 17.X.67, A. L. Tuttle.

Ixodes probably *lasallei*

Aragua: 1 ♂ from *Oryzomys albigularis*, Rancho Grande Biological Station, 1050 m elev., 9.VIII.65, N. E. Peterson.

Carabobo: 1 ♀, 5 NN from 1 *Dasyprocta aguti*, 1.7 km NNW Montalbán, Montero, 1091 m elev., 6.XI.67, A. L. Tuttle.

T. F. Amazonas: 3 NN from 1 *Myoprocta pratti*, 84 km SSE Esmeralda, Boca Mavaca, Río Orinoco, 185 m elev., 16.II.66, A. L. and M. D. Tuttle.

Distribution and Hosts

Mendez Arocha and Ortiz (1958) described *Ixodes lasallei* from the paca (*Agouti paca*) at Alto Orinoco, Territorio Federal Amazonas, Venezuela. Except for the three hosts mentioned above, all recorded collections of *I. lasallei* have been from *Agouti paca*.

I. lasallei is known only from Venezuela and Panama (Fairchild, et al., 1966).

Ixodes loricatus Neumann, 1899

Ixodes loricatus Neumann, 1899:139.

Material Examined

Aragua: 2 NN, 1 L from 1 *Monodelphis brevicaudata*, Rancho Grande Biological Station, 1081 m elev., 7.VIII.65, N. E. Peterson, et al.

Miranda: 3 LL from 1 *Marmosa robinsoni*, 19 km E Caracas, Curapao, 1160 m elev., 7.X.66, N. E. Peterson, et al.

Distribution and Hosts

The above specimens are only tentatively identified as *I. loricatus*. This species was first reported from Venezuela by Vogelsang and Cordero (1940) from *Didelphis* sp. in the Maracay Zoological Gardens, Aragua and at Naiguatá, Miranda.

It has been recorded off various species of *Didelphis*, *Marmosa* and *Ateles*. The distribution of *I. loricatus* also includes Mexico, Brazil, Paraguay, Uruguay, and Argentina.

Ixodes luciae Senevet, 1940

Ixodes luciae Senevet, 1940:896.

Ixodes loricatus var. *spinosus* Nuttall, 1910.

Ixodes scuticrenatus Vasques, 1946.

Ixodes loricatus vogelsangi Dias, 1954.

Material Examined

Aragua: 1 N, 1 L from 1 *Monodelphis brevicaudata*, Rancho Grande Biological Station, 14 km N, 14 km W Maracay, 1100 m elev., 22.IV.67, N. E. Peterson, et al.

BARINAS: 1 N, 2 LL from 1 *Monodelphis brevicaudata*, 5 km SW Altamira, El Filo, ? elev., 19.XII.67, A. L. Tuttle; 1 ♂ from *Didelphis marsupialis*, Altamira, ? elev., 19.XII.67, A. L. Tuttle; 1 N from *Monodelphis brevicaudata*, Altamira, El Filo, ? elev., 20.XII.67, A. L. Tuttle; 2 NN from 2 *Monodelphis brevicaudata*, 0.5 km SW Altamira, La Quinta, ? elev., 20-25.XII.67, A. L. Tuttle.

CARABOBO: 1 N, 35+ LL from 2 *Monodelphis brevicaudata*, 4.5 km SE Montalbán, Sabana Aguirre, 1055 m elev., 3-4.XI.67, A. L. Tuttle; 1 N, 5 LL from 1 *Monodelphis brevicaudata*, 1 km E Montalbán, Sanjou, 1091 m elev., 6.XI.67, A. L. Tuttle; 2 NN from 1 *Marmosa robinsoni*, 1 km SE Montalbán, El Merey, 1091 m elev., 8.XI.67, A. L. Tuttle; 1 N from *Monodelphis brevicaudata*, as above, 8.XI.67, A. L. Tuttle; 1 N, 4 LL from 1 *Sigmodon hispidus*, 1 km S Montalbán, Hato Larao, 1091 m elev., 22,24.XI.67, A. L. Tuttle; 1 N, 3 LL from 1 *Monodelphis brevicaudata*, as above, 24.XI.67, A. L. Tuttle; 2 ♀♀ from 1 *Didelphis marsupialis*, 3 km SW Montalbán, Hacienda La Canada, 1091 m elev., 24.XI.67, A. L. Tuttle; 1 L from *Marmosa robinsoni*, 2.5 km Montalbán, El Castano, 1072 m elev., 8.XI.67, A. L. Tuttle; 1 N from *Zygodontomys brevicauda*, Montalbán, Potrerito, 1091 m elev., 8.XI.67, A. L. Tuttle.

DTO. FEDERAL: 1 ♂ from *Didelphis marsupialis*, 5 km S, 25 km W Caracas, Alto Não Leon, 1880 m elev., 25.V.67, N. E. Peterson, et al.

FALCÓN: 6 ♂♂, 4 ♀♀ from 3 *Didelphis marsupialis*, 5 km N, 13 km E Mirimire, nr. La Pastora, 130-140 m elev., 21,30.XI.67, N. E. Peterson, et al.; 4 NN, 1 L from 2 *Monodelphis brevicaudata*, as above except 122 m and 145 m elev., 13,18.XI.67, N. E. Peterson, et al.

GUÁRICO: 4 ♂♂, 1 ♀ from 4 *Didelphis marsupialis*, 50 km S, 39 km E Caracas, nr. Guatopo Nat'l Park, 680 m elev., 22-25.IX.66, N. E. Peterson, et al.

MIRANDA: 3 LL from 1 *Oryzomys concolor*, 19 km E Caracas, Curapao, 1160 m elev., 9.X.66, N. E. Peterson, et al.; 3 NN from 1 *Marmosa cinerea*, as above, 1150 m elev., 14.X.66, N. E. Peterson, et al.; 1 N from *Monodelphis brevicaudata*, 6 km S Rio Chico, Hacienda La Guapa, 1 m elev., 8.XI.66, N. E. Peterson, et al.

T. F. AMAZONAS: 3 ♀♀ from 1 opossum, Tamatama, Rio Orinoco, 135 m elev., 3.V.67, M. D. Tuttle, F. L. Harder; 1 ♀, 1 N from 1 *Marmosa robinsoni*, as above, 15.V.67, M. D. Tuttle, F. L. Harder; 1 ♀ from *Philander opossum*, as above, 3.V.67, M. D. Tuttle, F. L. Harder; 5 ♀♀ from 2 *Philander opossum*, as above, 9,21.V.67, M. D. Tuttle, F. L. Harder; 1 ♀ from *Philander opossum*, 0.5 km from Capibara, NE side Casiquiare, 130 m elev., 9.VI.67, M. D. Tuttle, F. L. Harder; 1 ♀ from *Philander opossum*, 84 km SSE Esmeralda, Boca Mavaca, 138 m elev., 8.III.67, M. D. Tuttle, F. L. Harder; 3 NN from 1 *Oryzomys concolor*, Tamatama, Río Orinoco, 135 m elev., 21.V.67, M. D. Tuttle, F. L. Harder.

YARACUY *and* CARABOBO: 1 ♂ from *Didelphis marsupialis*, about 10 km NW Urama, 25 m elev., 8.III.66, A. L. and M. D. Tuttle; 1 N from *Marmosa cinerea*, 19 km NW Urama, Km 40, 5-25 m elev., 19.X.65, A. L. and M. D. Tuttle.

YARACUY: 14 ♂♂, 3 ♀♀ from 2 *Didelphis marsupialis*, 8 km N, 18 km W San Felipe, Minas de Aroa, 395 m elev., 13.XII.67, N. E. Peterson, et al.

ZULIA: 1 N from *Monodelphis brevicaudata*, Kasmera, nr. Sierra de Perijá, 10 km S, 18 km W Machiques, 270 m elev., 20.IV.68, N. E. Peterson, J. Matson.

Ixodes probably *luciae*

ARAGUA: 1 L from *Oryzomys albigularis*, Rancho Grande Biological Station, 1050 m elev., 11.VIII.65, N. E. Peterson.

DTO. FEDERAL: 15 LL from 1 *Oryzomys capito*, 3 km S, 46 km W Caracas, nr. El Limón, 398 m elev., 19.VIII.66, N. E. Peterson; 3 LL from 1 *Monodelphis brevicaudata*, as above, 20.VIII.66, N. E. Peterson.

FALCÓN: 2 ♂♂ from 1 *Didelphis marsupialis*, nr. Mirimire, ca. 250 m elev., 15.IX.67, N. E. Peterson, et al.; 2 NN, 5 LL from 2 *Monodelphis brevicaudata*, 4 km N, 13 km E Mirimire, nr. La Pastora, 90-125 m elev., 13,27.XI.67, N. E. Peterson, et al.; 1 N from *Monodelphis brevicaudata*, as above except 15 km E, 130 m elev., 29.XI.67, N. E. Peterson, et al.

GUÁRICO: 2 LL from 1 *Monodelphis brevicaudata*, 50 km S, 3 km E Caracas, nr. Guatopo, Nat'l Park, 680 m elev., 24.IX.66, N. E. Peterson, et al.

MÉRIDA: 2 LL from 1 *Cryptotis thomasi*, 5.5 km E, 2 km S Tabay, nr. middle Refugio, 2630 m elev., 16.IV.66, N. E. Peterson.

MIRANDA: 1 L from *Oryzomys fulvescens*, 19 km E Caracas, Curapao, 1160 m elev., 13.X.66, N. E. Peterson, et al.; 1 L from *Marmosa robinsoni*, 8 km S Caracas, nr. Turgua, 1144 m elev., 10.VIII.66, N. E. Peterson, et al.

T. F. AMAZONAS: 4 LL from 1 *Marmosa murina*, Río Cunucunuma, Belén, 150 m elev., 14.II.67, M. D. Tuttle, F. L. Harder; 1 L from *Caluromys philander*, as above, 21.XII.66, M. D. Tuttle, F. L. Harder; 4 LL from 1 *Oryzomys concolor*, 84 km SSE Esmeralda, Boca Mavaca, Rio Orinoco, 138 m elev., 19.III.67, M. D. Tuttle, F. L. Harder; 1 L from *Proechimys semispinosus*, 84 km SSE Esmeralda, Río Mavaca, about 20 mi. above mouth, 138 m elev., 20.III.67, M. D. Tuttle, F. L. Harder.

TRUJILLO: 1 L from *Marmosa robinsoni*, 10 km WNW Valera, nr. Isnotu, 930 m elev., 30.VIII.65, N. E. Peterson.

YARACUY: 1 N, 1 L from 1 *Oryzomys capito*, 8 km N, 18 km W San Felipe, Minas de Aroa, 400 m elev., 23.XII.67, N. E. Peterson, et al.

DISTRIBUTION AND HOSTS

As reported by Fairchild, et al., (1966) and supported by the above collection data, opossums are preferred hosts of *I. luciae* adults and rodents are favored by immature stages.

Mendez Arocha and Ortiz (1958) first recorded *I. luciae* from Venezuela. In addition to Venezuela this species has been recorded from Mexico, British Honduras, Guatemala, Colombia, Peru, French Guiana, Brazil, Argentina, Trinidad (Fairchild, et al., 1966), and Bolivia (Fonseca, 1960). The RML collection contains unpublished records from Nicaragua and Surinam.

Ixodes (*Ixodes*) *venezuelensis* Kohls, 1953

Ixodes venezuelensis Kohls, 1953:300.

MATERIAL EXAMINED

APURE: 2 NN from 2 *Proechimys semispinosus*, 3 km N Nula, San Camilo, Nulita, 24 m elev., 22,31.I.68, A. L. Tuttle; 2 NN as above, from 1 *Proechimys semispinosus*, 28.I.68, A. L. Tuttle.

Barinas: 6 NN, 4 LL from 2 *Monodelphis brevicaudata,* Altamira, El Filo, ? elev., 19.XII.67, A. L. Tuttle; 3 NN from 1 *Proechimys semispinosus,* Altamira, ? elev., 23.XII.67, A. L. Tuttle; 1 N from *Proechimys semispinosus,* 0.5 km SW Altamira, La Quinta, ? elev., 24.XII.67, A. L. Tuttle; 2 LL from 1 *Monodelphis brevicaudata,* as above, 25.XII.67, A. L. Tuttle; 6 NN from 3 *Proechimys semispinosus,* Altamira, 29.XII and 5.I.68, A. L. Tuttle.

Bolívar: 1 N from *Proechimys guyannensis,* 59 km SE El Dorado, Km 74, El Manaco, 150 m elev., 12.VI.66, A. L. and M. D. Tuttle; 1 N from *Proechimys guyannensis,* 45 km NE Icabarú, Santa Lucía de Surukun, 851 m elev., 7.V.68, A. L. Tuttle.

Carabobo: 7 NN, 1 L from 1 *Dasyprocta aguti,* Montalbán, Potrerito, 1091 elev., 7.XI.67, A. L. Tuttle; 13 NN from 1 *Dasyprocta aguti,* 1.7 km NNW Montalbán, Montero, 1091 m elev., 12.XI.67, A. L. Tuttle.

Dto. Federal: 1 ♀ from *Oryzomys albigularis,* 5 km NNE Caracas, 2095 m elev., 24.VIII.65, A. L. and M. D. Tuttle.

Mérida: 2 LL from 1 *Oryzomys minutus,* 4 km E Tabay, La Mucuy, 2127 m elev., 10.III.66, N. E. Peterson.

Miranda: 1 ♀ from *Heteromys anomalus,* 8 km S Caracas, nr. Turgua, 1144 m elev., 10.VIII.66, N. E. Peterson.

T. F. Amazonas: 1 N from *Didelphis marsupialis,* 84 km SSE Esmeralda, Boca Mavaca, Río Orinoco, 138 m elev., 17.III.67, M. D. Tuttle, F. L. Harder; 1 N from *Proechimys guyannensis,* Río Cunucunuma, Belén, 150 m elev., 3.I.67, M. D. Tuttle, F. L. Harder; 1 N from *Sciurus igniventris,* 84 km SSE Esmeralda, SW side of Río Mavaca, 138 m elev., 5.III.67, M. D. Tuttle, F. L. Harder; 1 N, 8 LL from 1 *Didelphis marsupialis,* 84 km SSE Esmeralda, Boca Mavaca, Río Orinoco, 138 m elev., 16.III.67, M. D. Tuttle, F. L. Harder; 5 LL from 1 *Philander opossum,* Río Cunucunuma Area, nr. Belén, 150 m elev., 19.I.67, M. D. Tuttle, F. L. Harder; 4 NN from 1 *Myoprocta pratti,* 108 km SSE Esmeralda, Río Mavaca, 140 m elev., 13.IV.67, M. D. Tuttle, F. L. Harder; 1 N, 1 L from 2 *Proechimys* sp., Casiquiare Canal, Capibara, 130 m elev., 29.V and 1.V.67, M. D. Tuttle, F. L. Harder; 1 L from *Philander opossum,* as above, 2.VI.67, M. D. Tuttle, F. L. Harder; 1 N, from *Philander opossum,* Río Cunucunuma, Belén, 150 m elev., 20.I.67, M. D. Tuttle, F. L. Harder; 1 N from *Proechimys guyannensis,* 25 km SSE Puerto Ayacucho, Paria, 114 m elev., 20.IX.67, A. L. Tuttle.

Trujillo: 1 ♀, 14 NN, 61+ LL from 2 *Monodelphis brevicaudata,* 10 km WNW Valera, nr. Isnotu, 900 m elev., 28-30.VIII.65, N. E. Peterson; 1 N from *Heteromys anomalus,* as above, 930 m elev., 30.VIII.65, N. E. Peterson; 2 LL from 2 *Oryzomys albigularis,* 14 km E Trujillo, Hda. Misisí, 2225-2360 m elev., 19, 21.I.66, N. E. Peterson; 1 N, 1 L from 2 *Oryzomys minutus,* as above, 2260-2360 m elev., 22,28.I.66, N. E. Peterson; 4 ♀♀, 19 NN, 10+ LL from 1 *Monodelphis brevicaudata,* 10 km WNW Valera, nr. Isnotu, 930 m elev., 27.VIII.65, N. E. Peterson.

Ixodes probably *venezuelensis*

Aragua: 1 L from *Oryzomys albigularis,* Rancho Grande Biological Station, 1050 m elev., 10.VIII.65, N. E. Peterson.

Trujillo: 1 L from *Marmosa dryas,* 15 km E, Trujillo, Hda. Misisí, 2360 m elev., 22.I.66, N. E. Peterson.

DISTRIBUTION AND HOSTS

In addition to the host information given above, females (the male is unknown) of *I. venezuelensis* are also known from *Nectomys* (Kohls, 1953), *Mus* sp. (Vogelsang and Santos Dias, 1953*b*), and *Zygodontomys* sp. (Fairchild et al., 1966). All known hosts for the immature stages are listed above.

Kohls (1953) described *I. venezuelensis* from material collected at Rancho Grande Biological Station and at Campamento Rafael Rangel, Sierra Maestra, Aragua, Venezuela. It also occurs in Colombia and Panama.

Ixodes spp.

MATERIAL EXAMINED

Apure: 2 NN were found on *Dasyprocta* sp.

Aragua: 3 NN, 10 LL were found on *Monodelphis brevicaudata* and *Oryzomys albigularis.*

Barinas: 1 L was found on *Sigmodon hispidus.*

Bolívar: 4 LL were found on the following hosts: *Marmosa murina, Nasua nasua,* and *Sturnira lilium.*

Carabobo: 1 L was found on *Sigmodon hispidus.*

Dto. Federal: 1 L was found on *Oryzomys albigularis.*

Falcón: 3 NN, 7 LL were found on the following hosts: *Artibeus jamaicensis, Marmosa robinsoni, Monodelphis brevicaudata, Proechimys semispinosus.*

Mérida: 18 NN, 96 LL were found on the following hosts, *Cryptotis thomasi, Marmosa murina, M. dryas, Oryzomys albigularis, O. minutus, O.* sp., *Rhipidomys venustus, Thomasomys laniger,* and *T. lugens.*

Miranda: 1 L was found on *Artibeus jamaicensis.*

Sucre: 1 N was found on *Desmodus rotundus.*

Táchira: 2 NN, 46 LL were found on the following hosts: bird, *Oryzomys minutus, Proechimys semispinosus, Rhipidomys venustus, Thomasomys aureus,* and *T. hylophilus.*

T. F. Amazonas: 6 NN, 13 LL were found on the following hosts: *Didelphis marsupialis, Philander opossum, Proechimys guyannensis,* and *Sciurus igniventris.*

Yaracuy: 9 LL were found on *Monodelphis brevicaudata* and *Oryzomys capito.*

Zulia: 1 L was found on *Proechimys semispinosus.*

Genus *Rhipicephalus* Koch, 1844

Rhipicephalus sanguineus (Latreille, 1806)

Ixodes sanguineus Latreille, 1806:157.

The systematic status of the species in the *R. sanguineus* complex is in a state of flux and any attempt at a complete synonymy would be unwarranted at this time. Commendable attempts at sorting out the synonymy of species in this group have been undertaken by Zumpt (1950) and Morel and Vassiliades (1963).

No specimens of *Rhipicephalus sanguineus* from Venezuela were available for study.

Distribution and Hosts

Rhipicephalus sanguineus was first recorded in Venezuela by Vogelsang (1936) and has been cited since that time by Vogelsang and Cordero (1940) and Vogelsang and Santos Dias (1953*a*). This species is probably the most widely distributed of any tick in the world. It is a common parasite of dogs throughout its range and attacks a variety of other hosts (Hoogstraal, 1956).

Doubtful Records

Argas persicus (Oken, 1818). Vogelsang and Cordero (1940) reported this species from Venezuela. However, many of the reports in the literature of the presence of *A. persicus* in South America have turned out to be *A. miniatus*. Confirmation of the presence of *A. persicus* in Venezuela must await the availability of material for examination, preferably reared larvae.

Argas reflexus (Fabricius, 1794). This species was reported from a zoological garden in Venezuela by Vogelsang and Cordero (1940). It is found only in Europe and the Middle East. Records of its presence in Venezuela are most likely the result of misidentification.

Ornithodoros turicata (Dugès, 1876). Neumann (1911) reported *O. turicata* from Venezuela. However, since there have been no further collections of this species from South America the record remains doubtful.

Amblyomma americanum (Linnaeus, 1778). According to Diaz-Ungria (1957), Rivas (1919) encountered this species in Venezuela. We were unable to obtain the paper by Rivas and we can find no evidence to substantiate its occurrence there.

Amblyomma exophthalmum Mendez Arocha and Ortiz, 1958. This species was described from a single female specimen, without a capitulum, from a dog in Venezuela. It has not been recorded again and we consider this species as doubtful until validated by study of additional material.

Amblyomma testudinis (Conil, 1877). The only report of this species in Venezuela is that of Vogelsang and Cordero (1940) from *Testudo tabulata* in captivity in the Maracay Zoological Garden. We have no evidence that this species is established in Venezuela.

Ixodes brunneus Koch, 1844. Cooley and Kohls (1945) record a single female off *Ramphastos variegatus*, coll. R. Matheson. This record was also cited by Mendez Arocha and Ortiz (1958). To our knowledge this is the only time *I. brunneus* has been collected in Venezuela and we doubt that it is established there.

Rhipicephalus bursa Canestrini and Fanzago, 1877. Diaz-Ungria (1957) stated that Rivas (1919) reported *R. bursa* in Venezuela and indicated it was probably imported on cattle. Vogelsang and Santos Dias (1953*a*) cite the Rivas record and discuss the possibility of the occurrence of this Palaearctic species in South America. Since it has never been collected again we can only conclude that either Rivas's identification was incorrect or *R. bursa* was introduced on imported animals and did not become established.

HOST-PARASITE LIST

(N = nymph; L = larva)

Class AMPHIBIA

- *Bufo* sp.
  - *Amblyomma dissimile* Koch ♂
- toad
  - *Amblyomma dissimile* Koch ♂, ♀, N
  - *Amblyomma* sp. NN

Class REPTILIA

Order SAURIA

- *Ameiva* sp.
  - *Amblyomma* sp. NN, LL
- *Iguana* sp.
  - *Ornithodoros puertoricensis* Fox LL
  - *Amblyomma dissimile* Koch ♂, ♀, N
  - *Amblyomma* spp. NN, LL
- lizards
  - *Ornithodoros puertoricensis* Fox LL
  - *Ornithodoros* spp. LL
  - *Amblyomma dissimile* Koch ♂, ♀, N, L
  - *Amblyomma* sp. NN, LL
- "squamata"
  - *Amblyomma dissimile* Koch ♀, N, L
  - *Amblyomma* sp. N, L

Order SERPENTES

- *Boa constrictor*
  - *Amblyomma dissimile* Koch ♂, ♀, N
- *Boa* sp.
  - *Amblyomma dissimile* Koch, ♂, ♀, N
- rattlesnake
  - *Amblyomma dissimile* Koch ♂
- snake
  - *Amblyomma dissimile* Koch, ♂, ♀, N, L
  - *Amblyomma* sp. L

Class AVES

Order PASSERIFORMES

Family Rhinocryptidae

- *Scytalopus* sp.
  - *Ixodes auritulus* group L
- "bird"
  - *Ornithodoros rudis* group L
  - *Amblyomma* sp. N, L
  - *Ixodes auritulus* group L
  - *Ixodes* sp. L

Class MAMMALIA

Order MARSUPIALIA

Family Caenolestidae

- *Caenolestes obscurus*
  - *Ixodes* (*E.*) *jonesae* Kohls, Sonenshine and Clifford L

Family Didelphidae

- *Caluromys philander*
  - *Ixodes luciae* group L
- *Chironectes minimus*
  - *Amblyomma* sp. L
- *Didelphis azarae*
  - *Amblyomma* sp. N
  - *Ixodes* sp. L
- *Didelphis marsupialis*
  - *Ornithodoros talaje* (Guérin-Meneville) L
  - *Amblyomma extraoculatum* Neumann ♂
  - *Amblyomma* sp. N, L
  - *Ixodes luciae* Senevet ♂, ♀, N
  - *Ixodes luciae* group ♂
  - *Ixodes venezuelensis* Kohls N, L
  - *Ixodes*, sp. N
- *Lutreolina crassicaudata*
  - *Amblyomma* sp. N, L
- *Marmosa cinerea*
  - *Amblyomma* sp. L
  - *Ixodes luciae* Senevet N
- *Marmosa dryas*
  - *Ixodes* probably *venezuelensis* L
  - *Ixodes* sp. N, L
- *Marmosa fuscata*
  - *Ixodes* sp. L
- *Marmosa murina*
  - *Amblyomma* sp. L
  - *Ixodes luciae* Senevet N
  - *Ixodes luciae* group L
  - *Ixodes* sp. L
- *Marmosa robinsoni*
  - *Ornithodoros marmosae* Jones and Clifford, L
  - *Ornithodoros puertoricensis* Fox L
  - *Ornithodoros* sp. L
  - *Amblyomma* sp. N, L
  - *Ixodes* near *loricatus* L
  - *Ixodes luciae* group N, L
  - *Ixodes*, sp. L
- *Marmosa* sp.
  - *Ornithodoros puertoricensis* Fox L
  - *Ornithodoros*, sp. L
- *Metachirus nudicaudatus*
  - *Amblyomma* sp. N, L
- *Monodelphis brevicaudata*
  - *Ornithodoros puertoricensis* Fox L
  - *Amblyomma* sp. N, L
  - *Ixodes* near *loricatus* N, L
  - *Ixodes luciae* Senevet N, L
  - *Ixodes luciae* group N, L
  - *Ixodes venezuelensis* Kohls ♀, N, L
  - *Ixodes* sp. N, L
- *Philander opossum*
  - *Amblyomma* sp. N, L
  - *Ixodes lasallei* Mendez Arocha and Ortiz N
  - *Ixodes luciae* Senevet ♀
  - *Ixodes venezuelensis* Kohls N, L
  - *Ixodes* sp. N, L
- "Opossum"
  - *Ixodes luciae* Senevet ♀, N

Order INSECTIVORA

Family Soricidae

- *Cryptotis thomasi*
  - *Ixodes luciae* group L
  - *Ixodes* sp. N, L

Order CHIROPTERA

Family Desmodidae

- *Desmodus rotundus*
  - *Ornithodoros azteci* Matheson, L
  - *Ornithodoros hasei* group L
  - *Ornithodoros rossi* Kohls, Sonenshine and Clifford, L
  - *Ornithodoros yumatensis* Cooley and Kohls, L
  - *Ornithodoros yumatensis* or near L
  - *Ornithodoros* sp. L
  - *Amblyomma* sp. L
  - *Ixodes* sp. N
- *Diphylla ecaudata*
  - *Ornithodoros yumatensis* Cooley and Kohls, L
  - *Ornithodoros* sp. L

Family Emballonuridae

- *Peropteryx kappleri*
  - *Ornithodoros azteci* Matheson, L
  - *Ornithodoros yumatensis* Cooley and Kohls, L
- *Peropteryx macrotis*
  - *Ornithodoros azteci* Matheson, L
  - *Ornithodoros* probably *azteci* L
  - *Ornithodoros rossi* Kohls, Sonenshine and Clifford, L
  - *Ornithodoros yumatensis* or near, L
  - *Ornithodoros* sp. L
- *Peropteryx trinitatis*
  - *Ornithodoros rossi* or near L
  - *Ornithodoros yumatensis* or near L
  - *Ornithodoros* sp. L
- *Peropteryx* sp.
  - *Ornithodoros hasei* (Schulze) L
- *Saccopteryx bilineata*
  - *Ornithodoros* sp. L

Family Molossidae

- *Molossops planirostris*
  - *Ornithodoros boliviensis* Kohls and Clifford L
  - *Ornithodoros* probably *boliviensis* L
  - *Amblyomma* sp. N
- *Molossus ater*
  - *Ornithodoros boliviensis* Kohls and Clifford L
  - *Ornithodoros* probably *boliviensis* L
  - *Ornithodoros hasei* (Schulze) ♂, ♀, L
  - *Ornithodoros* sp. L
  - *Amblyomma* sp. L
- *Molossus bondae*
  - *Ornithodoros boliviensis* Kohls and Clifford L
  - *Ornithodoros hasei* (Schulze) L
- *Molossus obscurus*
  - *Ornithodoros hasei* (Schulze) L

- *Neoplatymops mattogrossensis*
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros* sp. L
- *Tadarida gracilis*
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros setosus* Kohls, Clifford and Jones L
  - *Ornithodoros stageri* Cooley and Kohls L
  - *Ornithodoros talaje* group ♀
  - *Ornithodoros* sp. L

Family Phyllostomidae

- *Artibeus jamaicensis*
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros hasei* (Schulze) L
  - *Amblyomma* sp. N, L
  - *Ixodes* sp. L
- *Artibeus lituratus*
  - *Ornithodoros puertoricensis* Fox L
  - *Amblyomma longirostre* (Koch) N
  - *Amblyomma* sp. L
- *Artibeus* sp. D.
  - *Ornithodoros azteci* Matheson L
- *Carollia brevicauda*
  - *Amblyomma parvum* Aragão ♀
  - *Amblyomma* sp. N
- *Carollia perspicillata*
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros* probably *azteci* L
  - *Ornithodoros brodyi* Matheson L
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros yumatensis* Cooley and Kohls L
  - *Amblyomma* sp. N, L
  - *Boophilus microplus* (Canestrini) ♂, ♀, N (questionable host)
  - *Haemaphysalis juxtakochi* Cooley ♂, ♀ (questionable host)
- *Carollia* sp.
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros brodyi* Matheson L
  - *Ornithodoros hasei* (Schulze) L
- *Chiroderma salvini*
  - *Ornithodoros hasei* (Schulze) L
- *Chiroderma villosum*
  - *Amblyomma* sp. L
- *Choeroniscus minor*
  - *Amblyomma cajennense* (Fabricius) ♂, ♀ (questionable host)
  - *Amblyomma rotundatum* Koch ♀ (questionable host)
  - *Amblyomma* sp. N, L
- *Glossophaga longirostris*
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros rossi* Kohls, Sonenshine and Clifford L
  - *Amblyomma* sp. L
- *Glossophaga soricina*
  - *Ornithodoros azteci* Matheson L
  - *Amblyomma* sp. L
- *Leptonycteris curasoae*
  - *Antricola* sp. N
  - *Ornithodoros* sp. L
- *Lonchorhina aurita*
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros brodyi* Matheson L
  - *Ornithodoros hasei* (Schulze) L
- *Lonchorhina orinocensis*
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros rossi* Kohls, Sonenshine and Clifford L
  - *Ornithodoros* sp. L
- *Macrophyllum macrophyllum*
  - *Ornithodoros azteci* Matheson L
  - *Amblyomma calcaratum* Neumann ♂ (questionable host)
- *Mimon crenulatum*
  - *Ornithodoros* probably *boliviensis* Kohls and Clifford L
  - *Ornithodoros hasei* (Schulze) L
- *Mormoops megalophylla*
  - *Antricola silvai* Černý ♂, ♀, N, L
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros viguerasi* Cooley and Kohls L
- *Phyllostomus hastatus*
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros hasei* (Schulze) L
- *Pteronotus davyi*
  - *Antricola silvai* Černý L
  - *Antricola* sp. N, L
  - *Ornithodoros viguerasi* Cooley and Kohls L
  - *Ornithodoros* sp. L
- *Pteronotus parnellii*
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros* sp. L
  - *Amblyomma* sp. N, L
- *Pteronotus psilotis*
  - *Antricola silvai* Černý L
  - *Ornithodoros marinkellei* Kohls, Clifford and Jones L
- *Pteronotus suapurensis*
  - *Ornithodoros viguerasi* Cooley and Kohls L
- *Sturnira bogotensis*
  - *Ixodes* sp. N
- *Sturnira lilium*
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros* sp. L
  - *Boophilus microplus* (Canestrini) L (questionable host)
  - *Ixodes* sp. L
- *Sturnira ludovici*
  - *Ornithodoros hasei* (Schulze) L
  - *Ixodes* sp. N
- *Sturnira tildae*
  - *Amblyomma* sp. N
- *Trachops cirrhosus*
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros* sp. L
- *Uroderma bilobatum*
  - *Amblyomma* sp. L
- *Uroderma magnirostrum*
  - *Ornithodoros hasei* (Schulze) L
- *Vampyrops oratus*
  - *Amblyomma calcaratum* Neumann ♂
  - *Ixodes luciae* Senevet N, L (questionable host)
- *Vampyrops helleri*
  - *Amblyomma* sp. L

Family Noctilionidae

- *Noctilio labialis*
  - *Ornithodoros hasei* (Schulze) ♂, ♀, N, L
  - *Amblyomma* sp. N, L
- *Noctilio leporinus*
  - *Ornithodoros boliviensis* Kohls and Clifford L
  - *Ornithodoros hasei* (Schulze) L
  - *Ornithodoros tiptoni* Jones and Clifford L
  - *Ornithodoros* sp. L

Family Vespertilionidae

- *Eptesicus brasiliensis*
  - *Ornithodoros boliviensis* Kohls and Clifford L
  - *Amblyomma* sp. L
- *Eptesicus montosus*
  - *Ornithodoros eptesicus* Kohls, Clifford and Jones L

Amblyomma sp. L
Myotis albescens
Ornithodoros hasei (Schulze) L
Ornithodoros sp. L
Myotis keaysi
Amblyomma sp. N, L
Myotis nigricans
Ornithodoros sp. N, L
Rhogeëssa minutilla
Ornithodoros hasei (Schulze) L
Rhogeëssa tumida
Ornithodoros hasei (Schulze) L

Order PRIMATES

Family Cebidae

Alouatta seniculus
Amblyomma cajennense (Fabricius) ♀
Amblyomma sp. N
Aotus trivirgatus
Amblyomma sp. N
Callicebus torquatus
Amblyomma sp. N, L
Cebus albifrons
Amblyomma sp. N, L
Cebus nigrivittatus
Amblyomma sp. N
Haemaphysalis juxtakochi Cooley ♂
Chiropotes satanas
Amblyomma sp. N, L
Pithecia pithecia
Amblyomma sp. N, L

Family Hominidae

Homo sapiens
Amblyomma cajennense (Fabricius) ♂
Amblyomma oblongoguttatum Koch ♂
Amblyomma ovale Koch ♂, ♀
Amblyomma sp. N, L
Haemaphysalis juxtakochi Cooley N

Order EDENTATA

Family Bradypodidae

Bradypus infuscatus
Amblyomma varium Koch ♂, ♀
Amblyomma sp. L

Family Dasypodidae

Dasypus novemcinctus
Amblyomma auricularium (Conil) ♂, ♀, N, L
Amblyomma beaurepairei Vogelsang and Santos Dias ♂, ♀
Amblyomma cajennense (Fabricius) ♂
Amblyomma sp. N
Dasypus sabanicola
Amblyomma auricularium (Conil) ♂, ♀
Dasypus sp.
Amblyomma sp. N
Priodontes maximus
Amblyomma cajennense (Fabricius) ♀

Family Myrmecophagidae

Myrmecophaga tridactyla
Amblyomma cajennense (Fabricius) ♂, ♀
Amblyomma calcaratum Neumann ♂
Amblyomma nodosum Neumann ♂
Amblyomma scalpturatum Neumann ♂
Amblyomma sp. N
Tamandua longicaudata
Ornithodoros puertoricensis Fox L
Amblyomma auricularium (Conil) ♂, ♀
Amblyomma cajennense (Fabricius) ♂, ♀, N
Amblyomma calcaratum Neumann ♂, ♀
Amblyomma nodosum Neumann ♂, ♀
Amblyomma sp. N, L
Tamandua tetradactyla
Amblyomma calcaratum Neumann ♂
Amblyomma pacae Aragão ♂
Amblyomma sp. N, L

Order LAGOMORPHA

Family Leporidae

Sylvilagus brasiliensis
Amblyomma sp. N, L
Sylvilagus floridanus
Ornithodoros puertoricensis Fox L
Ornithodoros nr. *puertoricensis* L
Amblyomma parvum Aragão ♂, ♀, N, L
Amblyomma sp. N, L
Haemaphysalis juxtakochi Cooley ♀
Haemaphysalis leporispalustris (Packard) ♂, ♀, N, L

Order RODENTIA

Family Cricetidae

Akodon urichi
Ornithodoros hasei (Schulze) L
Amblyomma sp. N, L
Holochilus brasiliensis
Amblyomma ovale Koch N
Amblyomma sp. L
Nectomys squamipes
Amblyomma sp. L
Neacomys tenuipes
Amblyomma sp. L
Oryzomys albigularis
Ornithodoros sp. L
Ixodes auritulus group L
Ixodes probably *lasallei* ♂
Ixodes luciae group L
Ixodes venezuelensis Kohls ♀, L
Ixodes probably *venezuelensis* L
Ixodes sp. N, L
Oryzomys bicolor
Amblyomma sp. N, L
Oryzomys capito
Ixodes luciae group N, L
Ixodes sp. L
Amblyomma sp. L
Oryzomys concolor
Ornithodoros marmosae Jones and Clifford L
Amblyomma probably *ovale* N
Amblyomma sp. N, L
Ixodes luciae Senevet N, L
Ixodes luciae group L
Oryzomys fulvescens
Amblyomma tigrinum Koch ♂, ♀, N
Amblyomma sp. L
Ixodes luciae group L
Oryzomys minutus
Ixodes auritulus group L
Ixodes (*E.*) *jonesae* Kohls, Sonenshine and Clifford ♀, L
Ixodes venezuelensis Kohls L
Ixodes sp. N, L
Oryzomys sp.
Amblyomma sp. N, L
Ixodes luciae Senevet N
Ixodes luciae group N, L
Ixodes sp. N, L

- *Rhipidomys macconnelli*
  - *Amblyomma* sp. L
- *Rhipidomys venezuelae*
  - *Ornithodoros* sp. L
- *Rhipidomys venustus*
  - *Ixodes* sp. L
- *Sigmonys alstoni*
  - *Ornithodoros puertoricensis* Fox L
  - *Amblyomma* sp. N
- *Sigmodon hispidus*
  - *Amblyomma cajennense* (Fabricius) ♂, ♀
  - *Amblyomma* sp. L
  - *Ixodes luciae* Senevet, N, L
  - *Ixodes* sp. L
- *Sigmodon* sp.
  - *Amblyomma* sp. N, L
- *Thomasomys aureus*
  - *Ixodes* sp. N, L
- *Thomasomys hylophilus*
  - *Ixodes* sp. L
- *Thomasomys laniger*
  - *Ixodes* (*E.*) *jonesae* Kohls, Sonenshine and Clifford ♂, ♀, N, L
  - *Ixodes* sp. L
- *Thomasomys lugens*
  - *Ixodes auritulus* group L
  - *Ixodes* sp. L
- *Zygodontomys brevicauda*
  - *Ornithodoros azteci* Matheson L
  - *Ornithodoros puertoricensis* Fox L
  - *Ornithodoros talaje* (Guerin-Meneville) L
  - *Ornithodoros talaje* group L
  - *Ornithodoros* sp. N, L
  - *Amblyomma ovale* Koch N
  - *Amblyomma* probably *ovale* L
  - *Amblyomma* sp. N, L
  - *Ixodes luciae* Senevet N

Family Dasyproctidae

- *Agouti paca*
  - *Ornithodoros tuttlei* Jones and Clifford L
  - *Amblyomma naponense* (Packard) ♂
  - *Amblyomma pacae* Aragão ♂, ♀, N
  - *Amblyomma* sp. N, L
  - *Ixodes lassallei* Mendez Arocha and Ortiz ♂, ♀
- *Dasyprocta aguti*
  - *Amblyomma cajennense* (Fabricius) ♀
  - *Amblyomma* probably *cajennense* N, L
  - *Amblyomma* sp. N, L
  - *Haemaphysalis juxtakochi* Cooley N, L
  - *Ixodes* probably *lasallei* ♀, N
  - *Ixodes venezuelensis* Kohls N, L
- *Dasyprocta fuliginosa*
  - *Ornithodoros puertoricensis* Fox L
  - *Amblyomma* sp. N, L
  - *Haemaphysalis juxtakochi* Cooley N, L
  - *Haemaphysalis* sp. N
  - *Ixodes lasallei* Mendez Arocha and Ortiz ♀
- *Dasyprocta variegata*
  - *Amblyomma* sp. N
- *Dasyprocta* sp.
  - *Amblyomma cajennense* (Fabricius) ♀
  - *Amblyomma* sp. N
  - *Haemaphysalis juxtakochi* Cooley N, L
  - *Ixodes venezuelensis* Kohls N, L
  - *Ixodes* sp. N
- *Myoprocta pratti*
  - *Amblyomma* sp. L
  - *Ixodes* probably *lasallei* N
  - *Ixodes venezuelensis* Kohls N

Family Echimyidae

- *Echimys armatus*
  - *Amblyomma* sp. N, L
- *Echimys semivillosus*
  - *Ornithodoros echimys* Kohls, Clifford and Jones L
  - *Ornithodoros talaje* (Guerin-Menevllle) L
  - *Amblyomma* sp. L
- *Echimys* sp.
  - *Amblyomma* sp. N
- *Isothrix bistriata*
  - *Amblyomma* sp. N
- *Proechimys canicollis*
  - *Amblyomma ovale* Koch N, L
  - *Amblyomma* sp. N, L
- *Proechimys guyannensis*
  - *Ornithodoros puertoricensis* Fox L
  - *Ornithodoros* sp. L
  - *Amblyomma ovale* Koch N, L
  - *Amblyomma* sp. N, L
  - *Ixodes luciae* group L
  - *Ixodes venezuelensis* Kohls N
  - *Ixodes* sp. N, L
- *Proechimys hoplomyoides*
  - *Amblyomma* sp. L
- *Proechimys semispinosus*
  - *Ornithodoros puertoricensis* Fox L
  - *Ornithodoros* sp. L
  - *Amblyomma dissimile* Koch ♂, N, L
  - *Amblyomma ovale* Koch N
  - *Amblyomma pacae* Aragão N
  - *Amblyomma* sp. N, L
  - *Ixodes luciae* group L
  - *Ixodes venezuelensis* Kohls N, L
  - *Ixodes* sp. N, L

Family Erethizontidae

- *Coendou prehensilis*
  - *Amblyomma longirostre* (Koch) ♂, ♀
  - *Amblyomma* sp. L

Family Heteromyidae

- *Heteromys anomalus*
  - *Amblyomma ovale* Koch N
  - *Amblyomma* sp. N, L
  - *Ixodes venezuelensis* Kohls ♀, N

Family Hydrochaeridae

- *Hydrochaeris hydrochoeris*
  - *Amblyomma cajennense* (Fabricius) ♂, ♀
  - *Amblyomma* probably *cajennense* ♂, ♀
  - *Amblyomma coelebs* Neumann, ♀
  - *Amblyomma extraoculatum* Neumann ♂, ♀, N, L
  - *Amblyomma* probably *extraoculatum* L
  - *Amblyomma oblongoguttatum* Koch ♀
  - *Amblyomma tigrinum* Koch ♂
  - *Amblyomma* sp. N, L

Family Muridae

- *Rattus rattus*
  - *Amblyomma* sp. L
- "mouse"
  - *Amblyomma* sp. N

Family Sciuridae

- *Sciurus aestuans*
  - *Haemaphysalis juxtakochi* Cooley N
- *Sciurus gilvigularis*
  - *Amblyomma* sp. L

Sciurus granatensis
- *Amblyomma longirostre* (Koch) N, L
- *Amblyomma* probably *longirostre* L
- *Amblyomma* sp. N, L

Sciurus igniventris
- *Amblyomma* sp. N, L
- *Haemaphysalis juxtakochi* Cooley L
- *Ixodes venezuelensis* Kohls N
- *Ixodes* sp. L

Order CARNIVORA

Family Canidae

Cerdocyon thous
- *Amblyomma auricularium* (Conil) ♂
- *Amblyomma cajennense* (Fabricius) ♂
- *Amblyomma maculatum* ♀
- *Amblyomma ovale* Koch ♂, ♀
- *Amblyomma tigrinum* Koch ♂, ♀, N
- *Amblyomma* sp. N, L
- *Anocentor nitens* (Neumann) ♀, N
- *Boophilus microplus* (Canestrini) ♂, N

Family Felidae

Felis onca
- *Amblyomma ovale* Koch ♂, ♀

Felis pardalis
- *Amblyomma* sp. N, L
- *Ixodes lasallei* Mendez Arocha and Ortiz ♀

Felis yagouroundi
- *Amblyomma* sp. N, L

Family Mustelidae

Conepatus semistriatus
- *Ornithodoros puertoricensis* Fox L
- *Amblyomma auricularium* (Conil) ♂
- *Amblyomma ovale* Koch ♀

Eira barbara
- *Amblyomma ovale* Koch ♂, ♀, N
- *Amblyomma* sp. N, L

Galictis vittatus
- *Amblyomma auricularium* (Conil) ♂
- *Amblyomma* sp. N, L

Family Procyonidae

Bassaricyon gabbi
- *Amblyomma* sp. L

Nasua nasua
- *Amblyomma* sp. L
- *Ixodes* sp. L

Procyon cancrivora
- *Amblyomma cajennense* (Fabricius) ♂, ♀
- *Amblyomma ovale* Koch ♂, ♀
- *Amblyomma parvum* Aragão ♂, ♀

Order PERISSODACTYLA

Family Tapiridae

Tapirus terrestris
- *Ornithodoros tuttlei* Jones and Clifford L
- *Amblyomma cajennense* (Fabricius) ♂, ♀
- *Amblyomma coelebs* Neumann ♂, ♀
- *Amblyomma incisum* Neumann ♂, ♀
- *Amblyomma oblongoguttatum* Koch ♂, ♀
- *Amblyomma ovale* Koch ♂, ♀
- *Amblyomma scalpturatum* Neumann ♂, ♀
- *Amblyomma* sp. ♂, N, L
- *Haemaphysalis juxtakochi* Cooley ♂, ♀

Family Equidae

Equus caballus
- *Amblyomma maculatum* Koch ♂, ♀
- *Anocentor nitens* (Neumann) ♂, ♀, N, L
- *Boophilus microplus* (Canestrini) ♀

Order ARTIODACTYLA

Family Cervidae

Odocoileus virginianus
- *Amblyomma* sp. N, L
- *Boophilus microplus* (Canestrini) ♂, ♀, N

Mazama americana
- *Amblyomma sp.* ♀, N, L
- *Haemaphysalis juxtakochi* Cooley ♂, ♀, N, L

Mazama gouazoubira
- *Amblyomma* sp. N, L
- *Boophilus microplus* (Canestrini) ♂, N
- *Haemaphysalis juxtakochi* Cooley ♀, N

Mazama sp.
- *Amblyomma* sp. N
- *Boophilus microplus* (Canestrini) ♂, ♀, N

Family Tayassuidae

Tayassu pecari
- *Amblyomma cajennense* (Fabricius) ♂, ♀
- *Amblyomma naponense* (Packard) ♂, ♀
- *Amblyomma oblongoguttatum* Koch ♂, ♀
- *Amblyomma* sp. N, L

Tayassu tajacu
- *Amblyomma cajennense* (Fabricius) ♂, ♀, N, L
- *Amblyomma naponense* (Packard) ♂, ♀, N
- *Amblyomma oblongoguttatum* Koch ♂
- *Amblyomma* sp. N, L
- *Boophilus microplus* (Canestrini) ♀
- *Haemaphysalis juxtakochi* Cooley N, L

Miscellaneous
on "field sheet"
- *Amblyomma cajennense* (Fabricius) ♂, ♀

LITERATURE CITED

Aragão, H. B. 1908. Algumas novas especies de carrapatos brazileiros. Trabalho do Instituto de Manguinhos, Rio de Janeiro. 19 pp.

———. 1911. Notas sobre ixodidos brazileiros. Memorias do Instituto Oswaldo Cruz, Rio de Janeiro 3(2):145-195.

———. 1936. Ixodidas brasileiros e de alguns paizes limitrophes. Memorias do Instituto Oswaldo Cruz, Rio de Janeiro 31(4):759-843.

Aragão, H. B., and da Fonseca, F. 1961. Notas de Ixodologia. 9. O complexo *ovale* do gênero *Amblyomma*. Memorias do Instituto Oswaldo Cruz. Rio de Janeiro 59(2):131-148.

Arthur, D. R. 1960. A review of some ticks (Acarina: Ixodidae) of sea birds. Part II. The taxonomic problems associated with the *Ixodes auritulus-percavatus* group of species. Parasitology 50 (1-2):199-226.

Bello and Sucre. 1917. [cited in Brumpt, 1936, Precis de Parasitologie 2:1203]. Reference not available.

Brumpt, E. 1921. [cited in Brumpt, 1936, Precis de Parasitologie 2:1203] Reference not available

Canestrini, G. 1887. Intorno ad alcuni Acari ed Opilionidi dell' America. Atti Delli Societá Veneto-Trentina di Scienze Naturali Padova Residenti in Padua 11(1):100-109.

Cerný, V. 1967. Two new species of argasid ticks (Ixodoidea: Argasidae) from Cuba. Folia Parasitologica, Praha 14:141-148.

———. 1969. The tick fauna of Cuba. Folia Parasitologica, Praha 16:279-284.

Conil, P. A. 1878. Description d'une nouvelle espèce d'ixode, *Ixodes auricularius*. Acta de la Academia Nacional de Ciencias Exactas, Buenos Aires 3(2): 99-110.

Cooley, R. A., and Kohls, G. M. 1944. The Argasidae of North America, Central America and Cuba. American Midland Naturalist Monographs (1), p. 152.

———. 1945. The genus *Ixodes* in North America. National Institute of Health Bulletin (184):1-246.

Cooley, R. A. 1946. The genera *Boophilus, Rhipicephalus,* and *Haemaphysalis* (Ixodidae) of the New World. National Institute of Health Bulletin No. 187:1-54.

Cooley, R. A., and Kohls, G. M. 1941*a*. *Ornithodoros viguerasi*, a new species of tick from bats in Cuba (Acarina: Ixodoidea). Public Health Reports 56(9):396-399.

———. 1941*b*. Three new species of *Ornithodoros* (Acarina: Ixodoidea). Public Health Reports 56 (12):587-594.

Diaz-Ungria, C. 1957. Nota sobre las especies de Acarina de Venezuela. Revista de Sanidad y Asistencia Social 22(5-6):457-467.

Dugès, A. A. D. 1884. Turicata y garrapata de Guanajuato. La naturaleza, periodico cientifico de la Sociedad Mexicana de Historia natural, Mexico 6:195-198.

Dunn, L. H. 1927. Studies on the South American tick, *Ornithodoros venezuelensis* Brumpt, in Colombia. Its prevalence, distribution, and importance as an intermediate host of relapsing fever. Journal of Parasitology 13(4):249-255.

———. 1933. Observations on the host selection of *Ornithodoros talaje* Guern. in Panama. American Journal of Tropical Medicine 13(5):475-483.

Fabricius, J. C. 1787. Mantissa insectorum sistens species nuper detectas adiectis synonymis, observationibus, descriptionibus, emendationibus. Hafniae. 2, 382 pp.

Fairchild, G. B., Kohls, G. M., and Tipton, V. J. 1966. The ticks of Panama (Acarina: Ixodoidea). *In*: Ectoparasites of Panama, edited by Wenzel. R. L. and Tipton, V. J. Field Museum of Natural History, Chicago, Illinois, pp. 167-219.

Fiasson, R. 1949. Contribución al estudio de los ácaros de Venezuela. Revista Grancolombiana de Zootecnia Higiene y Medicina Veterinaria 3(7-9): 567-588.

Floch, H., and Fauran, P. 1958. Ixodidés de la Guyane et des Antilles Francaises. Archives de l'Institut Pasteur de la Guyane Francaise Publication (No. 446) 19:1-94.

Fonseca, F. da. 1960. Notas de acarologia. XLVI. Acarofauna zooparasita na Bolivia. Memorias do Instituto Butantan (1959) 29:89-141.

Fox, I. 1947. *Ornithodoros puertoricensis*, a new tick from rats in Puerto Rico. Journal of Parasitology 33(3):253-259.

Guérin Menneville, F. E. 1849. Description de l'*Argas talaje*. Revue et Magasin de Zoologie an. 12, 2.s, 1:342-344.

Hoogstraal, H. 1956. African Ixodoidea. I. Ticks of the Sudan (with special reference to Equatoria Province and with preliminary reviews of the genera *Boophilus*, *Margaropus*, and *Hyalomma*). Department of the Navy, Bureau of Medicine and Surgery, Washington, D.C., 1101 pp.

Jones, E. K., and Clifford, C. M. 1972. The systematics of the subfamily Ornithodorinae (Acarina: Argasidae). V. A revised key to larval Argasidae of the Western Hemisphere and description of seven new species of *Ornithodoros*. Annals of the Entomological Society of America 65(3):730-740.

Karsch, F. 1880. Vier neue Ixodiden des Berliner Museums. Mitteilungen des Munchener Entomologischen Vereins 4:141-142.

Koch, C. L. 1844. Systematische Uebersicht über die Ordnung der Zecken. Archiv für Naturgeschichte 10(1):217-239.

Kohls, G. M. 1953. *Ixodes venezuelensis*, a new species of tick from Venezuela, with notes on *Ixodes minor* Neumann, 1902 (Acarina: Ixodidae). Journal of Parasitology 39(3):300-303.

———. 1956. Concerning the identity of *Amblyomma maculatum*, *A. tigrinum*, *A. triste*, and *A. ovatum* of Koch, 1844 (Acarina, Ixodidae). Proceedings of the Entomological Society of Washington 58(3):143-147.

———. 1960. Records and new synonymy of New World *Haemaphysalis* ticks, with descriptions of the nymph and larva of *H. juxtakochi* Cooley. Journal of Parasitology 46(3):355-361.

———. 1969. New records of ticks from the Lesser Antilles. Studies on the Fauna of Curaçao and other Caribbean Islands 28(106):126-134.

Kohls, G. M., and Clifford, C. M. 1964. *Ornithodoros* (*Alectorobius*) *boliviensis* sp. n. (Acarina: Argasidae) from bats and houses in Bolivia. Journal of Parasitology 50(6):792-796.

Kohls, G. M., Clifford, C. M., and Jones, E. K. 1969. The systematics of the subfamily Ornithodorinae (Acarina: Argasidae). IV. Eight new species of *Ornithodoros* from the Western Hemisphere. Annals of the Entomological Society of America 62(5): 1035-1043.

Kohls, G. M., Hoogstraal, H., Clifford, C. M., and Kaiser, M. N. 1970. The subgenus *Persicargas* (Ixodoidea, Argasidae, *Argas*). 9. Redescription and New World records of *Argas* (*P.*) *persicus* (Oken), and resurrection, redescription, and records of *A.* (*P.*) *radiatus* Railliet, *A.* (*P.*) *sanchezi* Dugès, and *A.* (*P.*) *miniatus* Koch, New World ticks misidentified as *A.* (*P.*) *persicus*. Annals of the Entomological Society of America 63(2):590-606.

Kohls, G. M., Sonenshine, D. E., and Clifford, C. M. 1965. The systematics of the subfamily Ornithodorinae (Acarina: Argasidae). II. Identification of the larvae of the Western Hemisphere and descriptions of three new species. Annals of the Entomological Society of America 58(3):331-364.

———. 1969. *Ixodes* (*Exopalpiger*) *jonesae* sp. n. (Acarina: Ixodidae), a parasite of rodents in Venezuela. Journal of Parasitology 55(2):447-452.

Latreille, P. A. 1806. Genera crustaceorum et insectorum secundum ordinem naturalem in familias disposita, iconibus exemplisque plurimis explicata. Paris et Argentorati. 1, 302 pp.

Leite, I. C., and Ferreira, L. F. 1966. Ixodideos do Estado da Guanabara. Revista Brasileira de Medicina 23(9):623-626.

Matheson, R. 1935. Three new species of ticks, *Ornithodorus* (Acarina, Ixodoidea). Journal of Parasitology 21(5):347-353.

———. 1941. A new species of tick, *Ornithodoros anduzei*, (Ixodoidea, Argasidae) from bat caves in Venezuela. Boletin de Entomologia Venezelana 1(1):3-5.

Mendez Arocha, M., and Ortiz, I. 1957. Descripción del macho y redescripcion de la hembre de *Amblyomma crassum* Robinson 1926, (Acarina: Ixodidae). Memorias de la Sociedad Ciencias Naturales LaSalle (48), 17:190-199.

———. 1958. Revisión de las garrapatas venezolanas del género *Ixodes* Latreille, 1795 y estudio de un nuevo *Amblyomma* (Acarina: Ixodidae). Memorias de la Sociedad Ciencias Naturales LaSalle (51) 18:196-208.

Minning, W. 1934. Beitrage zur systematik und morphologie der zeckengattung *Boophilus* Curtice. Zeitschrift für Parasitenkunde 7(6):1-43.

Morel, P. C., and Vassiliades, G. 1963. Les *Rhipicephalus* du groupe *sanguineus*: espèces africanes. (Acariens, Ixodoidae). Revue d'Élevage et de Medecine Veterinaire des Pays Tropicaux, n.s. 15 (4):343-386 (1962).

Neumann, L. G. 1896. Révision de la famille des ixodides. (1er mémoire). Mémoires de la Societé Zoologique de France 9(1):1-44.

———. 1897. Révision de la famille des ixodides. (2^{e} mémoire). Mémoires de la Societé Zoologique de France 10(3-4):324-420.

———. 1899. Révision de la famille des ixodides. (3^{e} mémoire). Mémoires de la Societé Zoologique de France 12:107-294.

———. 1901. Révision de la famille des ixodides. (4^{e} mémoire). Mémoires de la Societé Zoologique de France 14(2-3):249-372.

———. 1904. Notes sur les ixodides. II. Archives de Parasitologie 8(3):444-464.

———. 1906. Notes sur les ixodides. IV. Archives de Parasitologie 10(2):195-219.

———. 1907. Quatre especes nouvelles d'ixodides. Notes from the Leyden Museum 29(2):88-100.

———. 1911. Ixodidae. Das Tierreich (26), 169 pp.

Nuttall, G. H. F., Warburton, C., Cooper, W. F., and Robinson, L. E. 1908. Ticks. A monograph of the Ixodoidea. Part I. The Argasidae. Cambridge at the University Press, London, pp. 1-104, Bibliography 35 pp.

Osorno-Mesa, E. 1941. Las garrapatas de la Republica de Colombia. Anales de la Academia de Medicina de Medellin (1938-1940), pp. 398-429.

Packard, A. S. 1869. List of hymenopterous and lepidopterous insects collected by the Smithsonian Expedition to South America, under Prof. James Orten; appendix to report on Articulates. Annual Report of the Peabody Academy of Science, pp. 56-69.

Pinto, C. 1930. Arthropódes parasitos e transmissores de doenças. Tomo I. Pimenta de Mello & Co.; Rio de Janeiro, pp. 1-395.

Reyne, A. 1923. Verslag van den entomoloog. Verslag. Department van Landbouw, Nijverheid en Handel in Suriname (1922), pp. 32-39.

Rivas, J. A. 1919. Contribucion al estudio de los Ixodes de Venezuela. Anales de la Direccion de Sanidad Nacional, Caracas, 1(1-2):90-96.

Robinson, L. E. 1926. Ticks. A monograph of the Ixodoidea. Part IV. The genus *Amblyomma*. Cambridge at the University Press. 302 pp.

Santos Dias, J. A. T. 1955. Identidade e sinonímia da éspecie *Amblyomma extraoculatum* Neumann, 1899 (Acarina, Ixodoidea). Memórias e Estudos do Museu Zoológico da Universidade de Coimbra (229), 6 pp.

———. 1958*a*. Notas Ixodológicas. IV. Estudo de alguns espécimes-tipos de Schulze em colecção no Museu de Hamburgo. Memorias e Estudos do Museu Zoologico da Universidade de Coimbra (250). 15 pp.

———. 1958*b*. Notes on various ticks (Acarina-Ixodoidea) in collection at some entomological institutes in Paris and London. Anais do Instituto de Medicina Tropical, Lisbon, 15(2):459-563.

Schulze, P. 1935. Zur vergleichenden anatomie de zecken. (Das sternale die mundwerkzeuge, analfurchen und analbeschilderung und ihre bedeutung, ursprunglichkeit und luxurieren. Zeitschrift für Morphologie und Ökologie der Tiere 30(1):1-40.

Senevet, G. 1940. Quelques Ixodides de la Guyane francaise. Espèces nouvelles d'*Ixodes* et d'*Amblyomma*. VI Congresco Internacional de Entomologia, Madrid (1935), pp. 891-898.

Tamsitt, J. R., and Fox, I. 1970. Records of bat ectoparasites from the Caribbean region (Siphonaptera, Acarina, Diptera). Canadian Journal of Zoology 48(5):1093-1097.

Vogelsang, E. G. 1936. Contribution al estudio de la parasitologia animal en Venezuela. V. Ectoparasitos. Revista de Policlinica, n° 30, 1936, pp. 2122-2124.

Vogelsang, E. G., and Cordero, E. H. 1940. Las garrapatas (Ixodidae) de Venezuela. Revista de Medicina Veterinaria y Parasitologia 2(1-2):71-75.

Vogelsang, E. G., and Santos Dias, J. A. T. 1953*a*. Contribucion al estudio de la fauna ixodologica de Venezuela. Revista de Medicina Veterinaria y Parasitologia 12(1-4):3-62.

———. 1953*b*. Nueva contribucion al estudio de la fauna ixodologica en Venezuela. Revista de Medicina Veterinaria y Parasitologia 12(1-4):63-89.

Zumpt, F. 1950. Preliminary study to a revision of the genus *Rhipicephalus* Koch. Moçambique; Documentario Trimestral (60):57-125 (1949).

S-NA P(rovo)

Brigham Young University
Science Bulletin

MUS. COMP. ZOOL
LIBRARY
FEB 17 1973
HARVARD
UNIVERSITY

SUCKING LICE OF VENEZUELAN RODENTS, WITH REMARKS ON RELATED SPECIES (ANOPLURA)

by

Phyllis T. Johnson

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 5

SEPTEMBER 1972

BRIGHAM YOUNG UNIVERSITY SCIENCE BULLETIN

BIOLOGICAL SERIES

Editor: Stanley L. Welsh, Department of Botany,
Brigham Young University, Provo, Utah

Members of the Editorial Board:

Vernon J. Tipton, Zoology
Ferron L. Andersen, Zoology
Joseph R. Murdock, Botany
Wilmer W. Tanner, Zoology

Ex officio Members:
A. Lester Allen, Dean, College of Biological and Agricultural Sciences
Ernest L. Olson, Chairman, University Publications

The Brigham Young University Science Bulletin, Biological Series, publishes acceptable papers, particularly large manuscripts, on all phases of biology.

Separate numbers and back volumes can be purchased from Publication Sales, Brigham Young University, Provo, Utah. All remittances should be made payable to Brigham Young University.

Orders and materials for library exchange should be directed to the Division of Gifts and Exchange, Brigham Young University Library, Provo, Utah 84601.

Brigham Young University
Science Bulletin

SUCKING LICE OF VENEZUELAN RODENTS, WITH REMARKS ON RELATED SPECIES (ANOPLURA)

by

Phyllis T. Johnson

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 5

SEPTEMBER 1972

TABLE OF CONTENTS

ABSTRACT 1

INTRODUCTION 1

TAXONOMY 2

- Key to the Genera of Rodent-Infesting Anoplura of Venezuela 2
- Genus *Enderleinellus* Fahrenholz, 1912 3
  - *Enderleinellus insularis* Werneck, 1948 3
  - *Enderleinellus venezuelae* Ferris, 1919 3
- Genus *Hoplopleura* Enderlein, 1904 3
- Key to Adults of Venezuelan Species of *Hoplopleura* 4
  - *Hoplopleura sciuricola* Ferris, 1921 6
  - *Hoplopleura arizonensis* Stojanovich and Pratt, 1921 6
  - *Hoplopleura aitkeni*, new species 8
  - *Hoplopleura travassosi* Werneck, 1932 11
  - *Hoplopleura abeli*, new species 15
  - *Hoplopleura rimae*, new species 17
  - *Hoplopleura angulata* Ferris, 1921 19
  - *Hoplopleura indiscreta*, new species 22
  - *Hoplopleura tiptoni*, new species 24
  - *Hoplopleura handleyi*, new species 25
  - *Hoplopleura brasiliensis* Werneck, 1932 27
  - *Hoplopleura exima*, new secies 27
  - *Hoplopleura quadridentata* (Neumann, 1901) 30
  - *Hoplopleura contigua*, new species 33
  - *Hoplopleura nesoryzomydis* Ferris, 1921 33
  - *Hoplopleura oryzomydis* Pratt and Lane, 1951 37
  - *Hoplopleura multilobata* Werneck, 1954 39
  - *Hoplopleura scapteromydis* Ronderos, 1965 40
  - *Hoplopleura fonsecai* Werneck, 1934 44
  - *Hoplopleura alata* Ferris, 1921 45
  - *Hoplopleura audax* Ferris, 1921 45
  - *Hoplopleura splendida*, new species 49
  - *Hoplopleura wernecki* (Guimarães, 1950) 51
  - *Hoplopleura imitans* (Werneck, 1942) 54
  - *Hoplopleura inusitata*, new species 54
  - *Hoplopleura orinocoi*, new species 57
- Genus *Fahrenholzia* Kellog and Ferris, 1915 59
  - *Fahrenholzia schwartzi* Werneck, 1952 59
- Genus *Neohaematopinus* Mjoberg, 1910 59
  - *Neohaematopinus semifasciatus* Ferris, 1916 59
- Genus *Polyplax* Enderlein, 1904 60
  - *Polyplax spinulosa* (Burmeista, 1839) 60

HOST-PARASITE LIST 60

LITERATURE CITED 61

SUCKING LICE OF VENEZUELAN RODENTS, WITH REMARKS ON RELATED SPECIES (ANOPLURA)

by

Phyllis T. Johnson[1]

ABSTRACT

The paper includes discussions and descriptions of species of Anoplura known to occur on Veneuelan rodents, and of certain other taxa related to Venezuelan forms. Five genera are represented: *Enderleinellus* Fahrenholz—2 species: *insularis* Werneck and *venezuelae* Ferris; *Hoplopleura* Enderlein—19 species, 11 of them new: *sciuricola* Ferris; *arizonensis* Stojanovich and Pratt; *aitkeni*, new species; *travassosi* Werneck; *abeli*, new species; *rimae*, new species; *angulata* Ferris; *indiscreta*, new species; *tiptoni*, new species; *handleyi*, new species; *eximia*, new species; *quadridentata* (Neumann); *contigua*, new species; *nesoryzomydis* Ferris; *oryzomydis* Pratt and Lane; *multilobata* Werneck; *splendida*, new species; *inusitata*, new species; and *orinocoi*, new species; *Fahrenholzia* Kellogg and Ferris—1 species: *schwartzi* Werneck; *Neohaematopinus* Mjöberg—1 species: *semifasciatus* Ferris, *sensu lato*; and *Polypax* Enderlein—1 species: *spinulosa* (Burmeister), which is found on introduced *Rattus* species. Keys to the genera and to the species of *Hoplopleura* are included. *Hoplopleura* is the most characteristic genus of Anoplura in South America, and there are several marked species groups within the genus. One of the groups was placed by Ewing (1923) in the genus *Pterophthirus*, which is considered a synonym of *Hoplopleura* Enderlein in this paper.

INTRODUCTION

The major portion of material reported on in this paper came from the cooperative Smithsonian-U.S. Army survey of Venezuelan mammals and their ectoparasites (Smithsonian Venezuela Project) that was directed by Dr. Charles O. Handley, Jr., U.S. National Museum of Natural History, and Dr. Vernon J. Tipton, now of Brigham Young University. The survey was begun in July 1965 and field phases terminated in June 1968. During this period, all ecological and geographical areas of the country were intensely and scrupulously sampled. Because of the intensity and breadth of the survey, we now have a comprehensive insight into the host specificity of all the more common species of rodent-infesting Anoplura found in Venezuela. Study of the collections of rodent-infesting Anoplura from neighboring Trinidad, and from northeastern Brazil, made by Dr. T. H. G. Aitkin of the Rockefeller Foundation, offered valuable supporting data. Also utilized during preparation of this study was a collection of Anoplura obtained during the Uruguay Expedition of the Department of Mammalogy, American Museum of Natural History, under a grant from the U.S. Army Medical Research and Development Command (No. DA-MD-49-193-63-G82), December 1962-May 1963. The author also examined various specimens of Nearctic and Neotropical sucking lice from the collections of the British Museum (Natural History), Field Museum of Natural History, U. S. National Museum of Natural History, and Division of Entomology, University of California, Berkeley (the Ferris Collection).

Holotypes of the new species described in this paper are deposited in the collections of the United States National Museum.

Most of the morphological terms used herein are ones traditionally employed for description of aspects of anopluran morphology. I have drawn on the papers of Kim (1965, 1966*a*, *b*) for certain terminologies of the setae of the dorsum of the head and follow Kim in using

---

[1] National Marine Fisheries Service Laboratory, Oxford, Maryland 21654

the term "genital seta" for the modified apical seta found on each of the pair of genital lobes or "gonopods" of the ninth segment of the female. I follow Ferris (1951:120) in regarding the first tergal abdominal plate, when present, as being that of the first abdominal segment (see the *travassosi*-group species of *Hoplopleura*, numbers 1-12). The shape of the abdominal setae often affords an excellent taxonomic character in the genus *Hoplopleura*. "Sword-shaped" setae are as in Fig. 24*b*; "inflated" setae are as in Fig. 24*a*; and "straight" setae are like that of Fig. 24*a*, but not medially broadened. In the female, the "genital plate" consists of the last sternal plate of segment 7 and the single sternal plate of segment 8. These plates may be coalesced or separate.

All the setae present on the legs and antennae have not been drawn in on the illustrations, but all setae of the head will be found on the enlarged drawings of this part, and all abdominal setae are present in the appropriate figures. In drawings of whole lice, heads, aedeagi, and thoracic sternal plates, the two lateral outlines of the longitudinal halves are as in the actual specimen. The "mirror-image" illustrative technique, though possibly satisfying aesthetically, can lead to improper emphasis of curves, protuberances, etc. Corresponding parts, on a single plate, are drawn to the same scale.

The numerous members of the genera *Hoplopleura* Enderlein and *Polyplax* Enderlein are the most characteristic anopluran parasites of the order Rodentia. While *Hoplopleura* appears to be the most important element of the South American anopluran fauna (the radiation in this group has been intense), *Polyplax* is represented on this continent only by *Polyplax spinulosa* (Burmeister), which is a parasite of introduced *Rattus* species.

Several of the species of *Hoplopleura* discussed and illustrated here are not present in Venezuela. They were included because of their relationship to Venezuelan species or species groups. All the anopluran species known to occur in Venezuela are identified by a star following the species name as it occurs as a heading. Individual hosts are identified by the SVP field number. In the case of material from the American Museum of Natural History and the U.S. National Museum, the collection number refers to the museum catalog number.

This paper is a contribution of the Smithsonian Venezuelan Project, supported by a contract (DA-49-193-MD-2788) of the Medical Research and Development Command, Office of the Surgeon General, U.S. Army.

TAXONOMY

Key to the Genera of Rodent-Infesting Anoplura of Venezuela

1. Anterior and middle legs of same size and form, both small and slender, posterior pair much larger; venter of abdomen with a pair of small, widely separated, sclerotized detached plates on segment 3 *Enderleinellus* Fahrenholz

Anterior legs the smallest of the three pairs, the second pair at least somewhat larger than the first and with a stouter claw; venter of abdominal segment 2 without a pair of detached plates 2

2. Middle and posterior pairs of legs large, subequal in size, first pair much smaller; paratergal plate II (of second abdominal segment) divided into two large, broadly separated sclerites, one lying on the venter, the other on the dorsum; paratergal plates absent on abdominal segments 5-8 in the Venezuelan species *Fahrenholzia* Kellogg and Ferris

Third pair of legs larger than second; if paratergal plate II is divided, the parts are contiguous; paratergal plates present on abdominal segments 2-8 3

3. Paratergal plates of segment 2 divided into two contiguous but separate parts, the dorsal one small and lacking setae; sternal plate of abdominal segment 2 extended laterally to approximate or articulate with the corresponding paratergal plate *Hoplopleura* Enderlein

Paratergal plates of segment 2 not so divided, though the center may be only lightly sclerotized; sternal plate of this segment not extended laterally 4

4. No indication of division of paratergal plate II; tarsal claw of first leg apically bifid in Venezuelan species; male with second tergal plate of abdominal segment 2 posteriorly emarginate and bearing a group of radially arranged setae at each end .... *Neohaematopinus* Mjöberg

With an indication of division of paratergal plate II (*i.e.*, with the center membranous); tarsal claw of first leg not apically bifid; second tergal plate of abdominal segment 2 of male not modified .... *Polyplax* Enderlein

Genus *Enderleinellus* Fahrenholz

Enderleinellus Fahrenholz, 1912:56. — Ferris, 1919:7.—Werneck, 1948*a*:281.—Ferris, 1951: 102.—Johnson, 1960:7.—Kim, 1966*a*:991.

Type Species: *Pediculus sphaerocephalus* Nitzsch (preocc.), orig. design. = *Enderleinellus nitzschi* Fahrenholz (*nomina nuda*).

Full synonymies and extensive discussions of *Enderleinellus* may be found in the papers listed above. All known species of this genus occur on members of the Sciuridae. Two species are known from Venezuela; one of these, *insularis* Werneck, was not collected during the present survey.

1. *Enderleinellus insularis* Werneck°

Enderleinellus extremus Ferris, 1919:24 (*partim*, records from *Sciurus nesaeus*).

Enderleinellus insularis Werneck, 1948*a*:293, Fig. 25-27. — Hopkins, 1949:457. — Ferris, 1951:105, 109.—Kim, 1966*a*:1018, Fig. 23, 40, 129-133.

The male holotype and 3 female and 3 male paratypes were taken from *Sciurus nesaeus* (now regarded as *Sciurus granatensis nesaeus*), FCM 16608, Venezuela: Margarita Island. It has not been recollected.

DIAGNOSIS

This species may be distinguished from *E. venezuelae* Ferris by characters given under that species.

2. *Enderleinellus venezuelae* Ferris°
(Fig. 1)

Enderleinellus venezuelae Ferris, 1919:25, Fig. 13.—Werneck, 1948*a*:292, Fig. 22-24.—Hopkins, 1949:457.—Ferris, 1951:106, 114.—Kim, 1966*a*:1017, Fig. 22, 39, 125-128.

The types were from *Sciurus granatensis* (as *S. griseogena*), Venezuela: Macuto. Ferris also recorded *venezuelae* from *Sciurus granatensis* (as *S. gerrardi*) in Venezuela. The specimens listed here are the first since the original description.

VENEZUELAN RECORDS

Two females, 1 male, 1 nymph ex *Sciurus granatensis* (SVP 32249), Carabobo, 4 km NNW Montalbán, El California, 7-XI-67, Tuttle team collectors; 2 females, 3 males, 1 nymph (SVP 34256, 34263, 34265), same host and data but 7-I-68; 6 females, 4 males, 5 nymphs (SVP 34089), same host and data but 2-I-68.

DIAGNOSIS

E. venezuelae can be distinguished from the other known Venezuelan species, *insularis* Werneck, in the female by its having the spermatheca oval rather than tubular, and in the male by its having the arms of the basal plate with a deeply *U*-shaped emargination rather than a very shallow one.

DISCUSSION

The specimens collected during this survey are similar to the type series. Probably all the nymphs are of the second and/or third instar, judging from the description and figures of *Enderleinellus* nymphs in Kim (1966*a*, *b*). They have 4 functional abdominal spiracles (Fig. 1), the first 2 being associated with paratergal plates that bear 2 short apical setae each. Each of the typical abdominal segments bears 2 median setae both dorsally and ventrally.

E. venezuelae occurred together with *Hoplopleura sciuricola* Ferris in two collections and with both *H. sciuricola* and *Neohaematopinus semifasciatus* Ferris in two collections.

Genus *Hoplopleura* Enderlein

Hoplopleura Enderlein, 1904:221. — Ferris, 1921:59.

Pterophthirus Ewing, 1923:147 (type species: *Hoplopleura alata* Ferris). New Synonymy: Ferris, 1932:280.—Ferris, 1951:144.

Hoplopleura Ferris, 1951:125. — Johnson, 1964:71.

Type Species: *Pediculus acanthopus* Burmeister (orig. design.).

Complete synonymical listings and descriptions may be found in Ferris (1921, 1951) and a revised description in Johnson (1964). *Hoplopleura* is the characteristic anopluran genus in South America. Not only do many typical species occur there, but also several very aberrant forms.

Ewing (1923) named the genus *Pterophthirus* to include *Hoplopleura alata* Ferris and *H. audax* Ferris. At the time it was described, *Pterophthirus* could be separated from *Hoplopleura* on the basis of the second paratergal plates being greatly elongate and because the first sternal plate of the third abdominal segment lacked modified apical setae. Several years after Ewing established the name, two more species were described as members of *Pterophthirus*: *imitans* Werneck, 1942 and *wernecki* Guimarães, 1950. Both Guimarães (1950) and Ferris (1951) pointed out that in some respects *imitans* and *wernecki* were transitional between *alata-audax* and typical members of the genus *Hoplopleura*. In both *imitans* and *wernecki* the dorsoapical lobe of paratergal plate II is prolonged, especially in *wernecki*; and, as with *alata* and *audax*, paratergal plate II has an apical membranous connection to the dorsum of the abdomen. However, the first sternal plate of the third abdominal segment does not approach the corresponding paratergal plate, and the paratergal plates are lateral in position rather than being almost entirely on the dorsal surface. Thus, as *imitans* and *wernecki* depart from typical *Hoplopleura* species in lacking the modified sternal plate of the third abdominal segment, they also depart from *alata-audax* in this regard, and approach typical *Hoplopleura* species by having paratergite II much less modified than in *alata-audax*, and by having the paratergal plates wrap around the lateral margin of the abdomen rather than being almost completely dorsal. Other species currently placed in the genus *Hoplopleura* lack the typically modified sternal plate of abdominal segment III: *disgrega* Ferris and *chilensis* Werneck from South America, and *bidentata* (Neumann), *diaphora* Johnson, *gyomydis* Kuhn and Ludwig, and *emarginata* Ferris from the Old World and Australia. All of these species, as well as *alata*-related forms, are like typical *Hoplopleura* in their having the second abdominal sternal plate articulate with the corresponding paratergal plate, and in the general facies of the head, form and positioning of abdominal setae, etc. Because the species listed above lack other consistent characters, it seems preferable to leave all the species in the genus *Hoplopleura*, suppressing the name *Pterophthirus* Ewing. Further discussion of the relationships of the South American species will be found later in this paper.

Key to Adults of Venezuelan Species of *Hoplopleura*

1. Paratergal plate II with a long winglike dorsoapical process that bears 2 thornlike setae medially (Fig. 168); from *Proechimys* .... 22. *splendida*, new species

   Dorsal lobe of paratergal plate II not prolonged, never longer than plate proper (Fig. 6) 2

2. Paratergal plate III with both dorsal and ventral lobes apically acute (Fig. 6, 9, 213, 214) 3

   Paratergal plate III with truncate or rounded apical lobes, these sometimes subdivided (Fig. 40, 89, 107) 7

3. First sternal plate of abdominal segment III not extended laterally to approach corresponding paratergal plate (Fig. 206); thoracic sternal plate poorly sclerotized, lateral margins ill defined (Fig. 215, 216) 4

   First sternal plate of abdominal segment III extended laterally (Fig. 19); thoracic sternal plate well sclerotized (Fig. 17) 5

4. Dorsum of head with accessory seta as long as principal one, postantennal area very broad, postantennal angles rounded (Fig. 211); from *Mesomys* .... 26. *orinocoi*, new species

   Dorsum of head with accessory seta shorter than principal dorsal seta, postantennal area not especially broad, postantennal angles not rounded (Fig. 208); from *Echimys* .... 25. *inusitata*, new species

5. Paratergal plates IV-V with both apical lobes quadrate (Fig. 9); male with one row of setae and one plate dorsally on each typical abdominal segment; from *Akodon urichi* .... 3. *aitkeni*, new species

   Paratergal plates IV-V with both apical lobes acute (Fig. 6); male with two plates and rows of setae dorsally on each typical abdominal segment 6

6. Abdomen laterally with numerous medially inflated setae, shorter than those on the sternal and tergal plates; aedeagus with lateral apical arms of pseudopenis narrow and laterally serrate; from *Sciurus* .... 1. *sciuricola* Ferris

Lateral setae of abdomen sword shaped, not strongly inflated medially, and as long as those on sternal and tergal plates; pseudopenis of aedeagus with broad, nonserrate arms (Fig. 8); from *Sigmodon* ... 2. *arizonensis* Stojanovich and Pratt

7. First antennal segment greatly enlarged (Fig. 145); paratergal plates IV-VI with dorsal apical seta (both apical setae minute) removed from margin to dorsal surface (Fig. 143); from *Oryzomys albigularis* ... 17. *multilobata* Werneck

First antennal segment not so enlarged (Fig. 49, 61, 80); paratergal plates IV-VI with 1 or 2 apical setae, but never with 1 removed from margin (Fig. 40, 42, 107) ... 8

8. Thoracic sternal plate posteroapically acute or narrowly rounded, the apex bearing a longitudinal mesal thickening or keel (Fig. 30); apical lobes of paratergal plate III quadrate, not subdivided (Fig. 40, 72, 89); *travassosi* group ... 9

Thoracic sternal plate posteroapically blunt or broadly rounded, lacking mesal sclerotization (Fig. 105, 125, 127); each of the apical lobes of paratergal plate III strongly subdivided into 2 lobules (Fig. 107, 120); *quadridentata* group ... 16

9. Paratergal plate VII with 2 apical lobes and plate VIII with 1 apical lobe (Fig. 89); from *Neacomys* ... 10. *handleyi*, new species

Paratergal plate VII with no more than 1 apical lobe, and plate VIII always lacking lobes (Fig. 40, 60) ... 10

10. Paratergal plate VII lacking apical lobes; plate III with 2 apical setae (Fig. 60, 82) ... 11

Paratergal plate III with 1 or 2 apical setae; plate VII with 1 apical lobe, rarely male has one or both plates lacking the lobe, but in this case plate III has but 1 apical seta ... 12

11. Postantennal angles strongly extended and angulate (Fig. 61); 1 apical seta of paratergal plate III obviously longer than apical lobes, and other much shorter (Fig. 60); pseudopenis of aedeagus flared laterally and serrate (Fig. 62); from *Rhipidomys* ... 7. *angulata* Ferris

Postantennal angles not strongly extended (Fig. 80); apical setae of plate III about same size; pseudopenis not flared or strongly serrate ... 13

12. Posterior margins of apical lobes of paratergal plates III-V oblique, bay between them noticeably broader apically than basally (Fig. 99); from *Anotomys* ... 12. *eximia*, new species

Apical lobes of paratergal plates III-V not oblique, bay between them not much broader apically than basally (Fig. 82); from *Thomasomys laniger* 9. *tiptoni*, new species

13. Paratergal plates III-IV each with 1 short apical seta (Fig. 42); aedeagus with pseudopenis strongly flared medially and grossly serrate laterally (Fig. 37); from *Oryzomys fulvescens* ... 4. *travassosi* Werneck

Paratergal plates III-IV both with 2 apical setae (Fig. 40, 72); pseudopenis may be strongly flared; if so, serrations are fine (Fig. 35, 36) ... 14

14. Tergal plate of first abdominal segment (most anterior of the abdominal tergal plates) with fimbriate posterior margin (Fig. 57*a*); from *Oryzomys minutus* ... 6. *rimae*, new species

Tergal plate of first abdominal segment not posteriorly fimbriate (Fig. 57*b*, *c*, 70, 71) ... 15

15. Postantennal angles somewhat extended and angulate; posteroventral head margins posteriorly convergent (Fig. 74); no setae laterally off abdominal plates (Fig. 70, 71); male with but 1 long apical seta on paratergal plate VII (Fig. 71); from *Thomasomys lugens* ... 8. *indiscreta*, new species

Postantennal angles not at all extended; posterolateral head margins parallel (Fig. 49); ventrally, abdomen with setae laterally off plates (Fig. 45, 46); male with 2 long apical setae on paratergal plate VII; from *Akodon bogotensis* 5. *abeli*, new species

16. Paratergal plate VII with 2 apical lobes; all paratergal plates reticulate and scaly (Fig. 107); from *Nectomys squamipes* ... 13. *quadridentata* (Neumann)

Plate VII with but 1 apical lobe; plates not particularly reticulate or scaly (Fig. 110, 120, 131) 17

17. Paratergal plates II-III each with 2 long apical setae, both extending beyond apices of corresponding lobes (Fig. 110); from *Holochilus brasiliensis* 14. *contigua*, new species

Paratergal plates II-III each with 1 long and 1 minute apical setae (minute seta may be missing on plate II) (Fig. 120, 131) 18

18. Paratergal plate VI with both apical lobes subdivided into equal lobules (Fig. 131); only Venezuelan collection was taken from *Nectomys squamipes* .... 16. *oryzomydis* Pratt and Lane

Plate VI with only the dorsal apical lobe subdivided, and often this division only indicated (Fig. 120); from *Zygodontomys* .... 15. *nesoryzomydis* Ferris

1. *Hoplopleura sciuricola* Ferris*

Hoplopleura sciuricola Ferris, 1921:110, Fig. 69, 70. — Hopkins, 1949:455-458. — Ferris, 1951:129, 143.—Cook and Beer, 1959:411, Fig. 13, 24, 29.

The type series was from *Sciurus carolinensis*, USA: Mississippi. This member of the *erratica* group has been recorded by Ferris (1921) and Hopkins (1949) from several other species of North American *Sciurus*, belonging to different subgenera, and in South America from *Sciurus* species from Venezuela, Colombia, Peru, and Bolivia.

VENEZUELAN RECORDS

This species was taken in 27 collections (64 females, 48 males, and 14 nymphs) in various localities in Carabobo, Barinas, and Apure from *Sciurus granatensis*. There was a single collection of 2 females ex *Sciurus igniventris* (SVP 16802), from T. F. Amazonas, Boca Mavaca.

DISCUSSION

The present Venezuelan specimens are essentially like North American specimens except that there are only 1 or 2, rather than 4-6, small setae above the mesothoracic spiracle in the adult, and the nymph has fewer abdominal setae. Also, the first instar of Venezuelan *sciuricola* may have either 1 or 2 terminal abdominal setae on each side.

Two of the collections from *S. granatensis* also contained specimens of *Enderleinellus venezuelae* Ferris, and two contained *E. venezuelae* and *Neohaematopinus semifasciatus* Ferris, as well.

2. *Hoplopleura arizonensis* Stojanovich and Pratt*

(Fig. 3, 6, 8)

Hoplopleura hirsuta Ferris, 1921:117 (*partim*, records from Arizona).

Hoplopleura arizonensis Stojanovich and Pratt, 1961*a*:313, Pl. II.

The male holotype and a series of male and female paratypes were taken from *Sigmodon* sp., USA: Arizona, Pinal County.

VENEZUELAN RECORDS

H. arizonensis is the typical anopluran parasite of Venezuelan *Sigmodon hispidus*. There were 15 females, 3 males, and 25 nymphs, in 17 collections, from various localities in Lara. One collection of 3 females ex *Oryzomys albigularis* (SVP 666), Dto. Federal, probably represents straggling or mechanical contamination.

DIAGNOSIS

H. arizonensis is a member of the *erratica* group and is closely related to *H. hirsuta* Ferris, which also occurs on *Sigmodon hispidus*. Male *arizonensis* can be separated from *hirsuta* by having 2 tergal plates per typical abdominal segment rather than 1, a rare occurrence in the genus *Hoplopleura*. As well, the male genitalia differ in the two species. In *arizonensis* the arms of the pseudopenis are heavy and of uneven thickness (Fig. 8) while in *hirsuta* the arms are narrow and of even width (Fig. 7). In both sexes of *arizonensis*, the preantennal region of the head is narrower than in *hirsuta*, with the mouthparts extending anteriorly (Fig. 3, 4). Unlike the type series of *arizonensis*, the paratergal plates of Venezuelan specimens are not measurably different from those of *hirsuta* (compare Fig. 5 and 6). Nymphs of *arizonensis* and *hirsuta* are similar except that those of *arizonensis* have the anterior head margin prolonged as in the adult.

DISCUSSION

The type of *hirsuta* was from North Carolina, and Ferris (1921) recorded *hirsuta* from various species of *Sigmodon* from Mexico, Venezuela, and Peru. His specimens from Arizona are *arizonensis* (*fide* Stojanovich and Pratt, 1961). Wenzel and Johnson (1966) recorded *hirsuta* from Panamanian *S. hispidus*. I have not seen Ferris's Venezuelan and Peruvian specimens, but one or both may be *arizonensis*, not *hirsuta*. Although these two closely related spe-

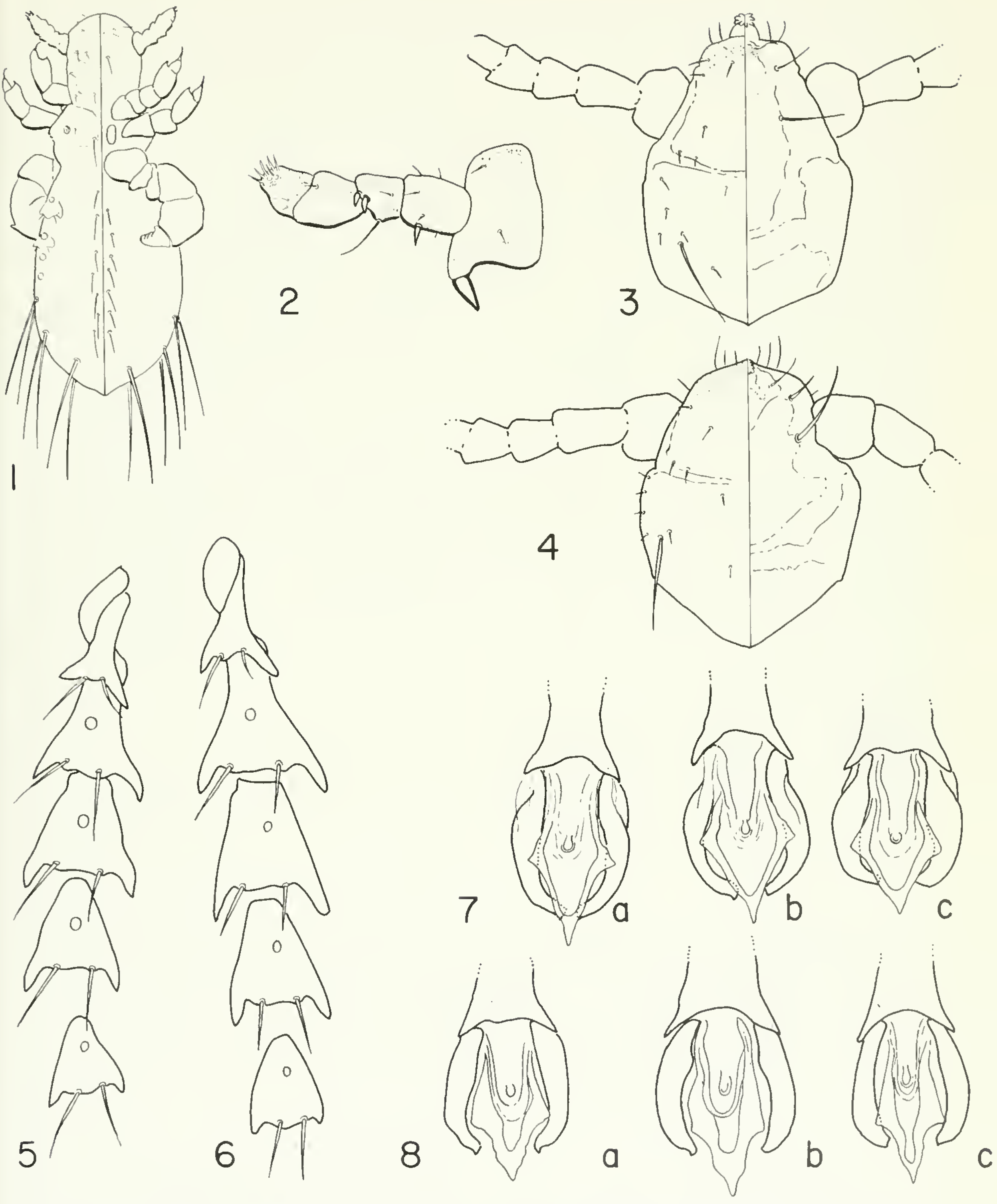


Fig. 1-8. 1, *Enderleinellus venezuelae* Ferris, nymph, second or third instar, ex *Sciurus granatensis* (SVP 34089); 2 *Neohaematopinus semifasciatus* Ferris, antenna, male, ex *S. granatensis* (SVP 33274); 3, *Hoplopleura arizonensis* Stojanovich and Pratt, head, male, ex *Oryzomys albigularis* (SVP 666); 4, *H. hirsuta* Ferris, head, male, Canal Zone, ex *Sigmodon hispidus*, 40065; 5, *H. hirsuta*, paratergal plates II-VI, female, Canal Zone, ex *S. hispidus*, 43287; 6, *H. arizonensis*, paratergal plates II-VI, female, ex *S. hispidus* (SVP 44757). Aedeagus: 7, *H. hirsuta*, ex *S. hispidus* (*a*, *b*, Canal Zone; *c*, Mississippi); 8 *H. arizonensis*, (*a*, Arizona ex *S. hispidus*; *b*, ex *Sigmodon hispidus* [SVP 44515]; *c*, ex *O. albigularis* [SVP 666].

cies of Anoplura occur on a single host species, it is not unlikely that they are allopatric. A study of the distribution of *hirsuta* and *arizonensis* would be of great interest.

3. *Hoplopleura aitkeni*, new species*
(Fig. 9-13, 17*a-c*, 18*a*, *b*, 19-22, 24*a*, 25)

Type Data: Male holotype, female allotype, 10 female, 3 male paratypes ex *Akodon urichi* (SVP 14322), Venezuela; Sucre, 26 km ESE Carúpano, Manacal, 425 m elev., 19-VII-67, Peterson team collectors; 1 female, 1 male paratypes (SVP 14636), as above but near Manacal, 190 m elev., 1-VIII-67. A series of paratypes, all ex *Akodon urichi*, Venezuela, as follows: 1 female (SVP 651), Dto. Federal, 5 km NNE Caracas, 2223 m elev., 19-VIII-65, Peterson and Tuttle collectors; 1 male (SVP 692), as above but 2230 m elev., 22-VIII-65; 2 females, 1 male (SVP 740), as above but 2232 m elev., 23-VIII-65; 1 male (SVP 1072), as above but 2135 m elev., 5-IX-65; 1 female, 2 males (SVP 13069), Dto. Federal, 29 km SW Caracas, 2025 m elev., 25-V-67, Peterson team collectors; 1 female (SVP 14760), Miranda, 15 km SW Caracas, IVIC, 1580 m elev., 19-X-67, Peterson team collectors; 1 female, 2 males (SVP 31929), Carabobo, 4.5 km SE Montalbán, Savannah Aguirre, 1055 m elev., 2-XI-67, Tuttle team collectors; 2 females, 1 male (SVP 32373), as above but Montalbán, Potserito, 1091 m elev., 9-XI-67; 4 females, 4 males (SVP 32459), as above but 10-XI-67; 3 males (SVP 32337), as above but 8-XI-67. 3 additional males, not paratypes, (SVP 32337).

Diagnosis

A member of the *hesperomydis-affinis* group. Closely related to *H. affinis* (Burmeister, 1839). Differs from *affinis* in that the anterior apex of the head is flattened, not prolonged, with the head almost as broad as long, and the small accessory dorsal head seta is either slightly anterior to, or very close to, the principal dorsal head seta rather than the 2 setae being very well separated and on a horizontal plane. As well, 1 of the ventral anterior head setae on each side is as long as the principal ventral head seta which occurs medially (Fig. 25, 26). It further differs in that the abdominal spiracles are small, and abdominal setae are elongate and only somewhat inflated medially rather than being sword shaped (Fig. 24*a*, *b*). It differs from its closest named South American relative, *H. argentina* Werneck, in having 1 apical lobe on paratergal plate VII (Fig. 9) rather than lacking lobes on this plate.

Lengths

Male holotype, 1.1 mm; female allotype, 1.5 mm; female paratypes, 1.2-1.5 mm; male paratypes, 0.9-1.1 mm.

Description

Female (Fig. 19): *Head* (Fig. 25, male). Only slightly rounded anteriorly, not projecting; almost as broad as long; postantennal angles broad; posterolateral margins slightly convergent posteriorly; separation between the 2 dorsal sclerites horizontal to posterior head margin. First antennal segment ventrally with prominent earlike lobe associated with an anteriorly directed seta. One of anterior subapical ventral setae as long as principal ventral seta; principal dorsal seta with the small accessory seta set very close, and anterior, to it. *Thorax*. Mesothoracic spiracle small; seta medial to spiracle long. Thoracic sternal plate (Fig. 17*a*) anteriorly angled, posterior extension narrowed only slightly to apex, which is blunt. *Abdomen*. Three narrow sternal and tergal plates per typical segment; their apical setae long and flexible, inflated medially; 1 or more setae laterally off plates on each of segments 4-7 both dorsally and ventrally. First segment lacking tergal plate, but with 2 small, broadly separated setae in this position; tergal plates of segment 2 and first plate of segment 3 poorly developed, each with 4 long, very thin apical setae broadly separated medially into 2 pairs; these setae thin. Paratergal plates (Fig. 9) with spiracles small. Plate III with apical lobes acute (subrounded in some paratypes) and extended laterally; both apical setae longer than apical lobes; Plates III-V with subquadrate apical lobes, one of the apical setae about as long as lobes, other small; plate VI with ventral lobe acute; plate VII with one acute dorsal lobe no longer than plate proper; plate VIII lacking apical lobes. Genital seta rather long, not strongly flattened.

Male (Fig. 20): As female except for usual sexual dimorphism. *Abdomen*. One tergal and 2 sternal plates per typical segment, their apical setae long, slightly inflated medially; several setae off plates both dorsally and ventrally. Paratergal plates as female except apical lobe of VII shorter (Fig.10) (in one paratype this lobe lacking on both sides, and in another lacking on one side). *Aedeagus* (Fig. 18*a*). Not distinctive; parameres evenly convex, blunt apically; pseudopenis serrate laterally.

Discussion

H. affinis and its allies have been discussed by Ferris (1921) and Werneck (1937). Ferris

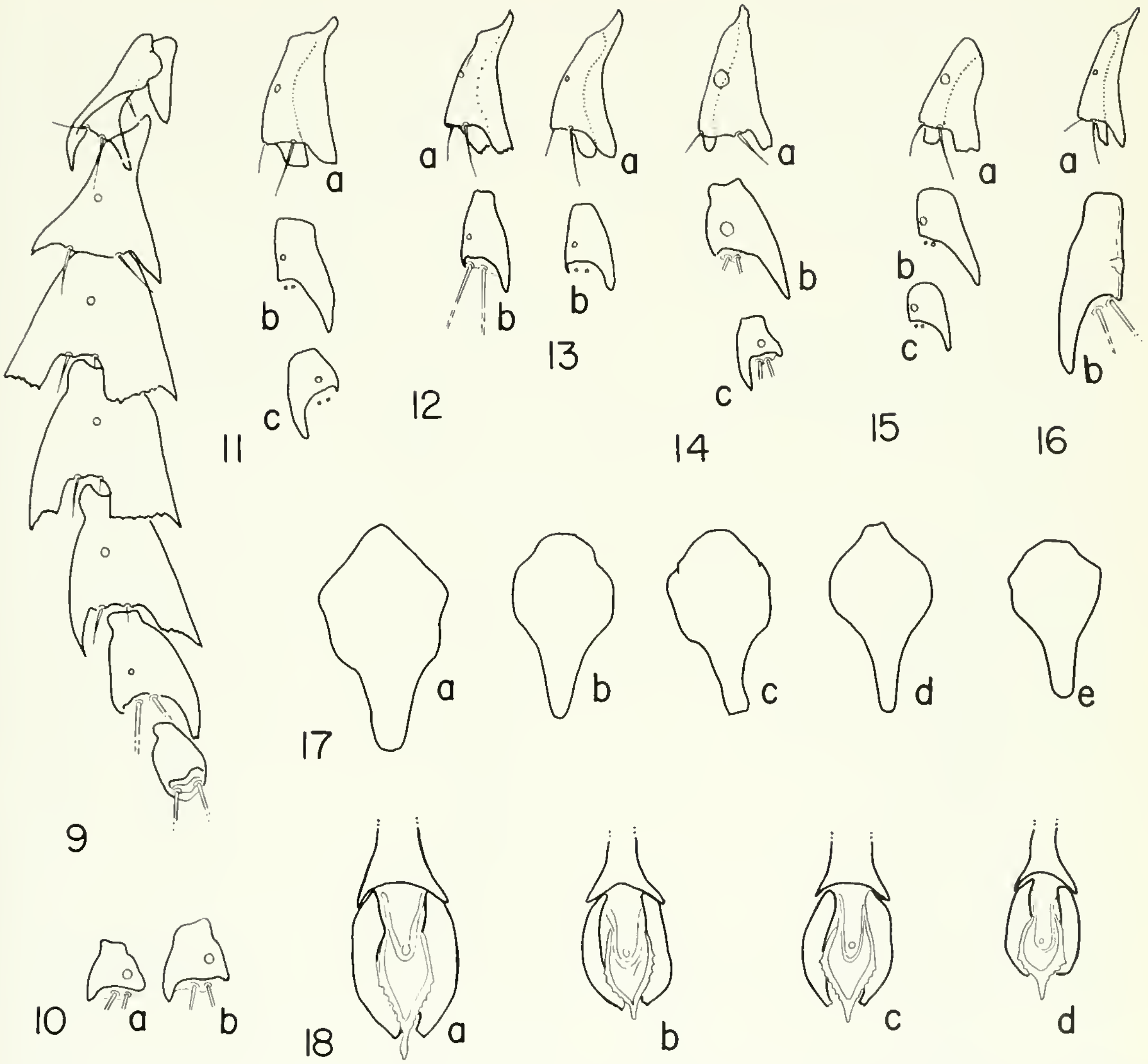


Fig. 9-18. *Hoplopleura affinis* group. Paratergal plates: 9, *H. aitkeni*, new species, female paratype (SVP 14322); 10, same, plate VII, male paratype (*a*, ex [SVP 13069]; *b*, ex [SVP 14322]); 11, *H. aitkeni, sensu lato*, plates III and VII Brazil ex "rodent" (*a*, female, plate III; *b*, female, plate VII; *c*, male, plate VII); 12, *H. aitkeni, sensu lato,* female. Ecuador ex *Akodon mollis* (*a*, plate III; *b*, plate VII); 13, as Fig. 12; 14 *H. affinis* (Burmeister), Korea. ex *Apodemus agrarius* (*a*, female, plate III; *b*, female, plate VII; *c*, male, plate VII); 15, *H. akenezumi* Sasa, ex *Apodemus speciosus* (*a*, female. plate III; *b*, female, plate VII; *c*, male. plate VII); 16, *H. affinis, sensu lato, female*, Peru ex *Phyllotis* (*a*, plate III; *b*, plate VII); 17, thoracic sternal plate, female (*a*, *H. aitkeni*, allotype; *b*, *H. aitkeni, sensu lato*, Brazil; *c*, *H. aitkeni, sensu lato*, Ecuador ex *Akodon mollis; d*, *H. affinis*, Korea ex *A. agrarius; e*, *H. affinis, sensu lato*, Peru ex *Phyllotis*); 18, aedeagus (*a*, *H. aitkeni*, paratype ex *A. urichi* [SVP 13069]; *b*, *H. aitkeni, sensu lato*, Brazil; *c*, *H. affinis*, Korea ex *A. agrarius; d*, *H. affinis, sensu lato,* Peru ex *Phyllotis*).

pointed out that while Old World specimens from *Apodemus speciosus* had notably large spiracles, those from South America had very small ones, and that the thoracic sternal plate is more angular in New World forms. With the specimens at his disposal, Ferris thought it best to include all in one species. Werneck (1937), when he described *argentina* (from *Reithrodon*), partitioned the species into (1) typical *affinis* from European and Asian Murinae (*Apodemus* species); (2) South American forms from the cricetines *Phyllotis* and *Akodon*, with small spiracles and an angulate thoracic sternal plate; (3) the form from the South American cricetine *Reithrodon*, which also has an angulate thoracic sternal plate and small abdominal spiracles but lacks lobes on paratergal plate VII (*H. argentina*); and (4) a species from the Old

World cricetine genus, *Cricetulus*, with 2 apical lobes on paratergite VII (this was later described as *H. cricetuli* Ferris, 1951).

Sasa (1950) described *H. akenezumi* based on specimens from Japanese *Apodemus speciosus*. This species was characterized by having the pair of setae medial to the mesothoracic spiracles very short, and both setae of paratergal plate III extending beyond the laterally projecting truncate apical lobes. Kaneko (1956) further divided the *affinis* complex by describing *H. himenezumi* from Japanese *Apodemus sylvaticus* (as *A. argenteus*). In *himenezumi* the mesothoracic dorsomedial setae are long, and the apical lobes of paratergal plate III are truncate and project posteriorly rather than laterally, so that the bay between the lobes is quadrate. Kaneko compared *himenezumi* with speci-

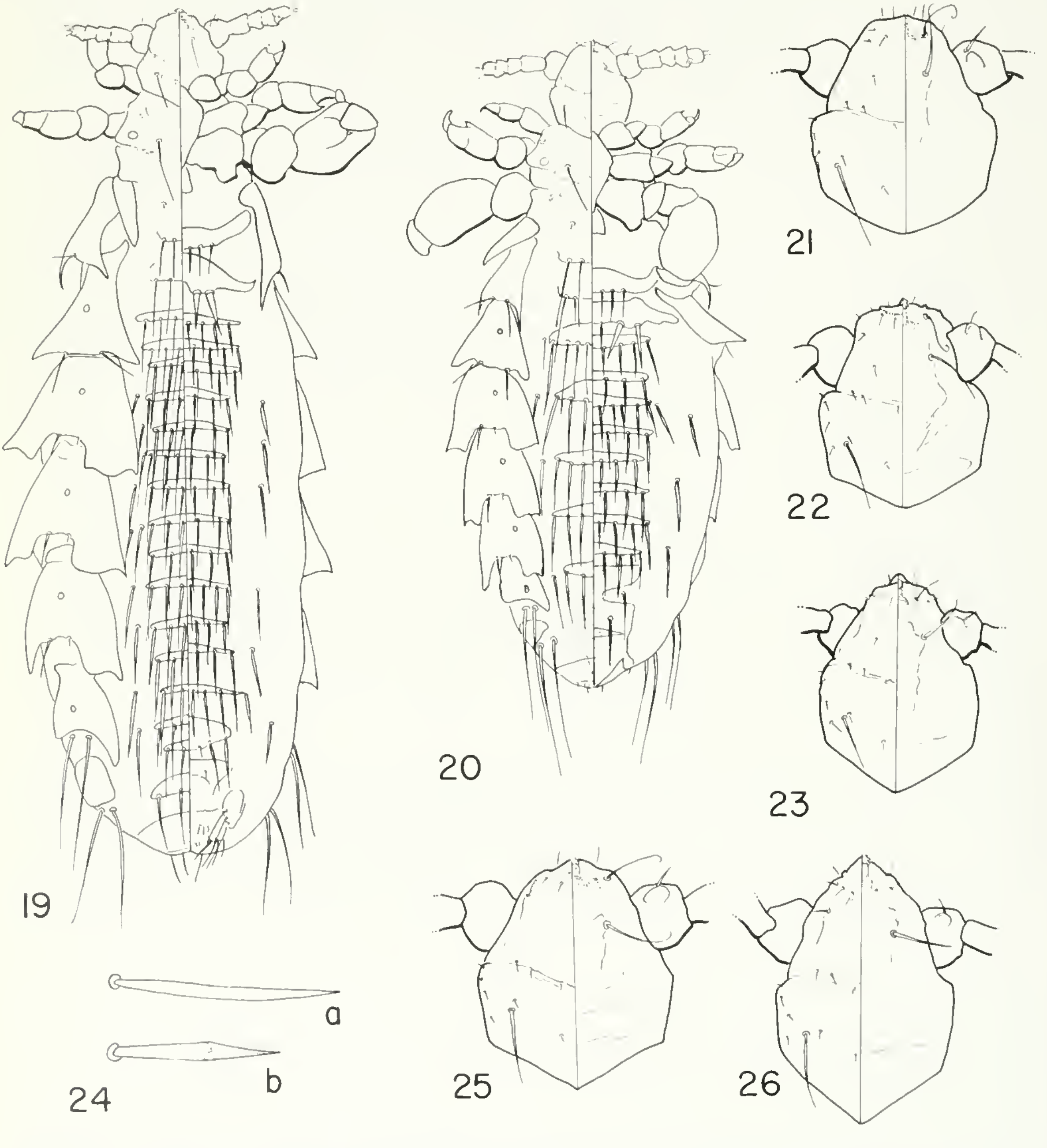


Fig. 19-26. *Hoplopleura affinis* group. 19, *H. aitkeni*, new species, allotype; 20, same, holotype; 21, *H. aitkeni*, *sensu lato*, head, male, Brazil; 22, same, head, female, Ecuador ex *Akodon mollis;* 23, *H. affinis*, *sensu lato*, head, male Peru ex *Phyllotis;* 24 abdominal setae (*a*, *H. aitkeni*, holotype; *b*, *H. affinis*, Korea ex *Apodemus agrarius*); 25, *H aitkeni*, head, holotype; 26, *H. affinis*, head, male, Korea ex *A. agrarius*.

mens of *affinis sensu strictu*, from an unspecified host from Manchuria.

I have seen specimens from the Old World *affinis* complex from *Apodemus agrarius*, Korea; *Apodemus sylvaticus semotus*, Formosa; and *Apodemus sylvaticus tauricus*, Turkey. Hopkins (1949) has pointed out that by priority of mention, *A. agrarius* is the type host of *H. affinis* (Burmeister). I have examined specimens from South America as follows: the type series of *aitkeni*, new species; two collections from *Phyllotis gerbillus*, Peru (Field Museum of Natural History and U.S. National Museum); one collection from *Akodon mollis*, Ecuador; and a collection from an undetermined rodent, Nova Teutonia, Brazil (Field Museum of Natural History).

All members of the *affinis* complex have well-developed earlike lobes on the venter of the first antennal segment, the size being somewhat dependent upon the species. The specimens from Korean *A. agrarius*, being from the type host, can be considered true *affinis* (Burmeister). They have large spiracles, and the thoracic sternal plate is rounded laterally, not angulate (Fig. 17*d*); the head is prolonged anteriorly (Fig. 26); abdominal setae are sword shaped (Fig. 24*b*); the anteroventral head setae are all short; and the principal dorsal head seta and its accessory seta are on a horizontal plane and well separated. Unlike the male Ferris (1921) figured, from German *A. agrarius*, the apical setae of paratergal plate III, though of different length, both extend beyond the apical lobes (Fig. 14*a*). The apical lobes of plate III vary from rounded-acute to slightly truncate (4 males and 5 females examined). The one pair I saw from *A. sylvaticus*, Turkey, had truncate apical lobes on paratergal plate III.

I consider the specimens from Formosan *Apodemus sylvaticus* (3 males and 5 females) to be *H. akenezumi* Sasa. They are very like *affinis, sensu strictu*, but the dorsomedial mesothoracic setae are short and the abdominal spiracles rather small. Paratergal plates III and VII are as in Fig. 15.

Except for the specimens from Peruvian *Phyllotis gerbillus*, the South American representatives of the *affinis* complex have small spiracles; elongate, somewhat inflated setae on the abdomen (Fig. 24*a*); one of the anteroventral head setae prolonged; the accessory and principal dorsal head setae close together, with the accessory seta somewhat anterior; and the preantennal part of the head not as prolonged as in the Old World specimens. Except for size, the male genitalia are similar in all forms (Fig. 18*a*, *b*). The Peruvian specimens from *Phyllotis* have the head somewhat prolonged anteriorly (Fig. 23), and none of the anteroventral head setae are especially long. Otherwise, they are similar to *aitkeni*, new species, and other South American specimens. They may represent a different species; but, without comparing further individuals with good host information, it was felt best merely to note the differences and consider these forms to be "*affinis sensu latus*." The others, from Ecuadorian *Akodon mollis* and the undetermined Brazilian rodent are provisionally referred to *H. aitkeni*, new species.

Lengths of the various forms, as mounted on slides, are overlapping: *affinis* (Korea and Turkey): females, 1.15-1.3 mm; males, 0.85-1.0 mm; *akenezumi* (Formosa): females, 1.05-1.2 mm; males, 0.8-0.95 mm; *aitkeni*, new species (Brazil): female, 1.3-1.4 mm; male, 1.1 mm; *aitkeni*, new species (Ecuador): female, 1.25 mm, *affinis sensu latus* (Peru, from *Phyllotis*): female, 1.15 mm; male, 0.9 mm.

Hoplopleura aitkeni, new species, is named for Dr. T. H. G. Aitken, Rockefeller Foundation. For a period of years, Dr. Aitken made extensive collections of ectoparasites in Trinidad—the first from that island. They have provided us with extremely valuable information on the hostal and geographic distribution of the South American sucking lice.

4. *Hoplopleura travassosi* Werneck*
(Fig. 27-29, 31, 37, 42, 47, 48, 57*b*)

Hoplopleura travassosi Werneck, 1932:345, Fig. 1.—Werneck, 1934:409, Fig. 1-6.—Hopkins, 1949:469, 471, 495.—Ferris, 1951:127, 143.—Ronderos and Capri, 1966:96.

In the brief original description, types were not designated nor was the sex of the specimens mentioned. The type host, from Brazil: State of Río de Janeiro, was given as "wild rat." In a later paper, Werneck (1934) said that the type collection consisted of 2 females from *Oryzomys flavescens*. He also recorded further specimens from Brazilian *O. flavescens*, State of Santa Catarina, and from *Kannabateomys amblyonyx* and *Oxymycterus judex* from the same locality. Ronderos and Capri have recorded this species from *Oryzomys flavescens*, Argentina; Province of Buenos Aires. Hopkins (1949) pointed out that the record from the echimyid *Kannabateomys* is probably erroneous. The records from *Oxymycterus* are probably also erroneous or represent accidental occurrence.

In addition to the Venezuelan specimens recorded below, I have seen a series of *travassosi* collected by the American Museum of Natural History in Uruguay. There were 5 females, 3

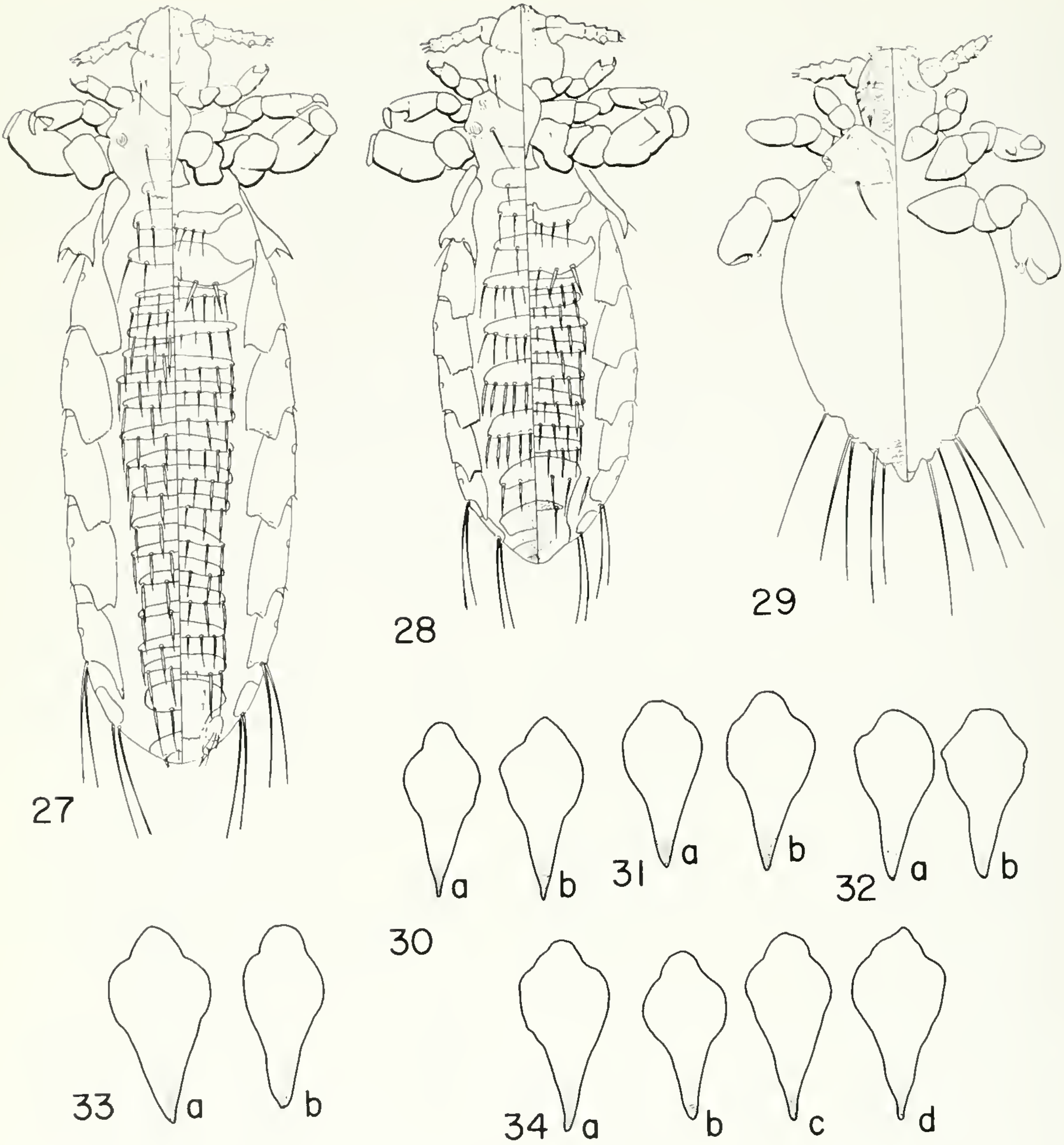


Fig. 27-34. *Hoplopleura travassosi* group. 27 *H. travassosi* Werneck female ex *Oryzomys fulvescens* (SVP 13653), 28. same. male; 29, same, nymph, third instar, Uruguay ex *Oryzomys delticola*, AMNH-205968. Thoracic sternal plate: 30, *H. rimae*, new species (*a*, holotype; *b*, allotype); 31. *H. travassosi*, ex (SVP 13653) (*a*, male; *b*, female); 32, *H. abeli*, new species (*a*, holotype; *b*, allotype); 33. *H. cooki* Kim (*a*, holotype; *b*, allotype); 34, *H. similis* Kim (*a*, holotype; *b*, allotype; *c*, female paratype from type collection; *d*, male. from type collection).

males, and 1 nymph in 5 collections from *Oryzomys delticola*, Departments of Durazno, Tacuarembo, and Maldonado, and 2 females in 2 collections from *Oryzomys flavescens*, Department of Rocha.

Venezuelan Records

One female, 1 male ex *Oryzomys fulvescens* (SVP 3745), Dto. Federal. 20 km W Caracas; 5 females, 5 males (SVP 13653, 13677, 13712, 14290), same host but Monagas, near Caripe, 2 females (SVP 14070). same host but Sucre, near Caripe. One female, 2 males ex *O. fulvescens* (SVP 13813, 14037, 14164), Monagas, near Caripe; 65 females, 54 males, 1 nymph ex *O. concolor* (SVP 44125, 44128, 44130), Falcon Capatárida; 1 female ex *Rhipidomys venustus* (SVP 13703), Monagas, near Caripe. A collection of 1 female, 2 nymphs ex *O. bicolor* (SVP 43691), Monagas. 55 km SE Maturin, Hato Mata de Bejuco, is doubtfully included in the series of *travassosi*. The very large collection (61 females, 53 males, 1 nymph) attributed to

O. concolor (SVP 44130) may have been erroneous since no lice were listed for this number on the original data sheets. The collection from *Rhipidomys venustus* also represents accidental occurrence or is erroneous.

DIAGNOSIS

A member of the *hesperomydis-affinis* complex. Closely related to *H. angulata* Ferris. Easily separated by not having the postantennal head margins enlarged (Fig. 48) and by having an apical lobe on paratergal plate VII (Fig. 42). Also very closely related to *cooki* Kim, *similis* Kim, and *torresi* Ronderos and Capri. *H. travassosi* differs from *torresi* by having an apical lobe on paratergal plate VII. It is like *cooki* and *similis* in most respects, but in both sexes *travassosi* has only a single dorsal apical lobe on paratergal plate VII, while females of *similis* and *cooki* have 2 apical lobes on this plate (Fig. 43, 44*b*), and *cooki* females also have at least an incipient lobe on plate VIII.

LENGTHS

Female, 1.25-1.4 mm; male, 1.0-1.05 mm.

REDESCRIPTION

MALE (Fig. 28): *Head* (Fig. 48). Anteriorly rounded; postantennal angles rounded, not strongly extended; posterolateral margins slightly convex and convergent posteriorly. Principal dorsal seta thin, its accessory seta small, thin, set close to principal one. *Thorax* with seta medial to mesothoracic spiracle long. Sternal plate (Fig. 31) rounded to slightly bulbous anteriorly, evenly tapering posteriorly from rounded lateral angles to an acute posterior apex that has a mesal keel-shaped ridge. *Abdomen*. Tergal plate of first segment (Fig. 57*b*) with 2 posteroapical setae, these broadly separated but set well in from posterolateral corners; posterior margin serrate; anterior margin concave medially. Tergal plate of segment 2 and first plate of segment 3 with 4 setae each, set in broadly separated pairs. Typical segments with well-developed plates; 2 each ventrally and 1 each dorsally; sternal plates and setae of segments 2-3 arranged as usual. Tergal plates of typical segments with posteromarginal setae large, sword shaped, of even length. Setae of sternal plates also sword shaped, medial ones on each plate smaller than lateral ones. Ventrally, 1 seta off plates, either side, on segment 7. Paratergal plates (Fig. 42, female) III-VI with 2 scaly, quadrate apical lobes and 1 stout short seta that is less than half length of apical lobes. Plates IV-VI, and rarely plate III, with second minute apical seta. Plate VII with narrow, scaly dorsal lobe somewhat less than half the length of plate bearing it. Plates VII-VIII with usual 2 long apical setae. *Aedeagus* (Fig. 37) with pseudopenis flared laterally, strongly serrate at this point, apex narrow, often arrow shaped.

FEMALE (Fig. 27): As male except in usual sexually dimorphic characters. Tergal abdominal setae sword shaped; setae of sternal abdominal rows sword shaped laterally, smaller and thin medially. No setae off plates. Genital plate divided; genital seta short, acute, bladelike.

NYMPH (Fig. 29): Available Venezuelan nymphs were damaged during mounting and not in condition to describe; therefore, this description is based on a single nymph taken from Uruguayan *Oryzomys delticola*. Head flattened anteriorly, with thornlike spicules coronally and ventrally; antennae ventrally spiculated also. Dorsum of head reticulate (not noticeably so in Venezuelan specimens). Principal dorsal head seta stout, short, thornlike, its accessory seta minute; other dorsal head setae small, thornlike. Abdomen with 2 pairs and a single terminal setae on each side. Anal lobe short; posterior apex of abdomen reticulate dorsally (not evident in Venezuelan specimens).

DISCUSSION

H. travassosi may serve as the typical member of a group in the *hesperomydis-affinis* complex that is characterized by the following: (1) the accessory dorsal head seta is present and near the principal dorsal setae; (2) the thoracic sternal plate is elongate, with its posterior part narrowly triangular, more or less acute, and apically with a longitudinal keellike mesal ridge; (3) there is a well-marked tergal plate bearing 2 posteroapical setae on abdominal segment 1; (4) paratergal plates III-VI have 2 quadrate apical lobes, plate III usually has a single apical seta, and plates IV-VI have 2 apical setae, usually 1 of them minute and the other longer; and (5) females have short, broad, sometimes bladelike genital setae. There are other species that are related to the Neotropical *travassosi* group, but these are not included in this discussion.

All the known *hesperomydis*-like species (not including the *affinis*-related forms) from South America belong to this group. All are from cricetine rodents (*Oryzomys*, *Rhipidomys*, *Calomys*, *Akodon*, *Thomasomys*, *Neacomys*, and *Anotomys*). As well as six new species named and described in this paper, the *travassosi* group includes: *travassosi* Werneck; *similis* Kim (from Mexican *Oryzomys fulvescens* and Bolivian *Oryzomys chaparensis*); *cooki* Kim (from Argentinian *Calomys callosus*); *torresi* Ronderos and Capri (from Argentinian *Oryzomys flavescens*);

and *brasiliensis* Werneck (from *Oryzomys capito* in Brazil and in Trinidad).

H. travassosi appears to have the broadest host and geographical distribution; although, especially when nymphs are available in quantity sufficient for definitive study, all the populations may be found not to consist of a single species. In Venezuela the population from *O. fulvescens* that I have called *travassosi* shows no variation as far as the apical lobes of the paratergal plates are concerned, but the thoracic sternal plate is relatively variable in width and length. The female from *Oryzomys bicolor* has 2 lobes on paratergal plate VII, and the posterolateral head margins are more convex than in the other specimens. Concerning Uruguayan *travassosi*, the head shape may be slightly different from the Venezuelan individuals

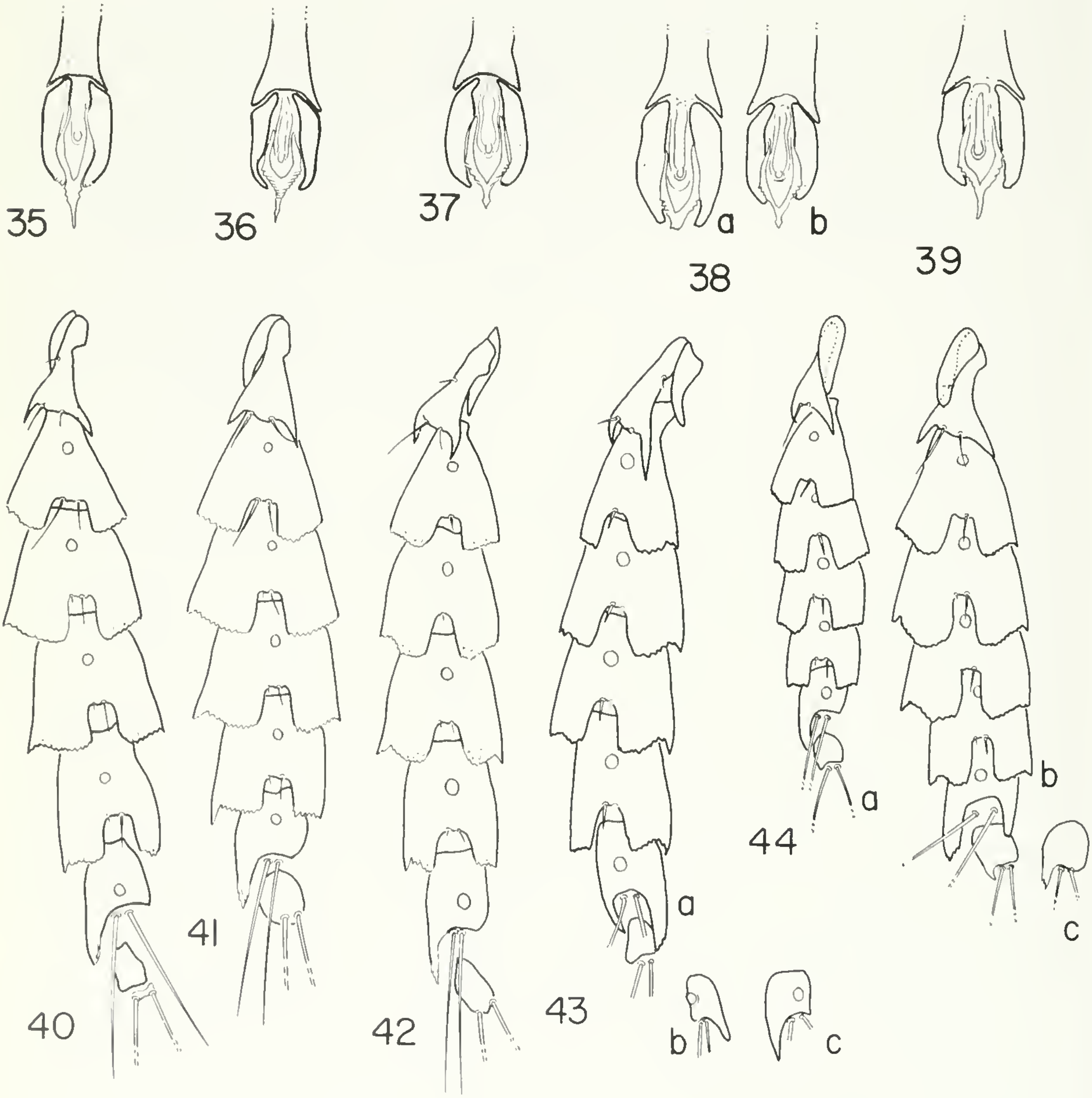


Fig. 35-44. *Hoplopleura travassosi* group. Aedeagus: 35, *H. abeli*, new species, holotype; 36, *H. rimae*, new species, holotype, 37, *H. travassosi* Werneck ex *Oryzomys fulvescens*, (SVP 13653); 38, *H. similis* Kim (*a*, Mexico from type collection; *b*, allotype); 39, *H. cooki* Kim, allotype. Paratergal plates: 40, *H. abeli*, female paratype ex *Akodon bogotensis* (SVP 4327); 41, *H. rimae*, female paratype ex *Oryzomys minutus* (SVP 1159); 42, *H. travassosi*, female (SVP 13653), 43, *H. similis* (*a*, holotype; *b*, plate VII, allotype; *c*, plate VII male, Mexico, from type collection); 41, *H. cooki* (*a*, allotype; *b*, holotype; *c*, plate VII, other side of holotype).

from *O. fulvescens* (Fig. 47, 48), but this could be due to differences in mounting. *H. cooki*, *similis*, and *torresi* all differ from *travassosi sensu strictu* mainly in the development of apical lobes on paratergal plates VII-VIII (Fig. 42-44). Not mentioned in the original descriptions is the fact that while females of *similis* and *cooki* have 2 apical lobes on paratergal plate VII, the males, like *travassosi*, have but 1 apical lobe on this plate. This is true of the allotype of *similis* from Bolivia, a male from the same collection as the female holotype (and which was not seen by Kim); and of both the male allotype and a male paratype of *cooki* that I have seen from the Ferris Collection. Females of *H. cooki* have either a small dorsal lobe on plate VIII or an incipient lobe in this position (Fig. 44*b*, *c*). The thoracic sternal plate of all these species is very similar (Fig. 31, 33, 34), and heads (Fig. 51-53) and aedeagi (Fig. 38, 39) are also quite similar. *H. cooki* has the dorsal abdominal setae less sword shaped than in the others.

H. torresi, judging from the original description and the accompanying figures, differs from *travassosi* mainly in not having an apical lobe on paratergal plate VII. As figured, the thoracic sternal plate is similar to that of *travassosi*. If the host information is correct (both *travassosi* and *torresi* were taken from *Oryzomys flavescens* at the same location in Argentina), probably *torresi* is either a sibling species or a variant of *travassosi*. In a new species from *Oryzomys minutus*, also closely related to *travassosi*, rare, aberrant males lacked an apical lobe on either one or both of paratergal plates VII. The male holotype of a second new species from *Neacomys* lacks the apical lobe on one of these plates. Thus, some variability in lobation may be expected within a single species of the *travassosi* group.

5. *Hoplopleura abeli*, new species[*]

(Fig. 32, 35, 40, 45, 46, 49, 57*c*)

TYPE DATA: Male holotype, female allotype ex *Akodon bogotensis* (SVP 4284), Venezuela: Merida, 5 km E, 6.5 km S Tabay (Laguna Verde), 3815 m elev., 20-III-66, Peterson team collectors; 2 female paratypes (SVP 4327), as above but 3540 m elev., 22-III-66, Peterson, Parrish, and Tipton collectors; 1 female paratype (SVP 4299), as above but 21-III-66; 1 female and 1 male paratypes ex *A. bogotensis* (SVP 21931), Venezuela: Tachira, 35 km S, 22 km W San Cristobal (Buena Vista), 2400 m elev., 17-III-68, Peterson team collectors; 1 female paratype (SVP 21972), as above but 23-III-68.

Also Examined: 4 females and 1 male ex *Akodon bogotensis* (SVP 3828), Venezuela: Trujillo, 15 km E Trujillo, Hda. Misisi, 2360 m elev., 20-I-66, Peterson team collectors.

DIAGNOSIS

A member of the *travassosi* group. Close to *travassosi* Werneck. Separable in both sexes by having 2 well-developed apical setae on paratergal plate III (Fig. 40) and with several setae off abdominal plates ventrally. Further separable by the configuration of the tergal plate of the first abdominal segment, which is only lightly sclerotized, not noticeably spiculated, with a scalloped posterior margin, and the apical setae very small and thin (Fig. 57*c*).

LENGTHS

Male holotype, 0.95 mm; female allotype, 1.2 mm; female paratypes, 1.2-1.3 mm; male paratype, 1.05 mm.

DESCRIPTION

MALE (Fig. 46): *Head* (Fig. 49). Rounded-truncate anteriorly; postantennal angles rounded, not protruding; posterolateral margins straight, only slightly convergent posteriorly; principal dorsal seta thin, its accessory seta thin, set close to principal one. *Thorax*. Seta medial to mesothoracic spiracle long. Thoracic sternal plate (Fig. 32) rounded to bulbous anteriorly, posteriorly apex subacute. *Abdomen*. Tergal plate of first abdominal segment (Fig. 57*c*) faintly sclerotized, its 2 posteromarginal setae rather small, posterior margin scalloped. Tergal plate of segment 2 with 3 thin setae (4 in paratype); first tergal plate of segment 3 with row of 7 thin, posteromarginal setae; lateral ones longer (8 in paratype). Tergal and sternal plates arranged as usual: 2 sternal and 1 tergal plates per typical segment; sternal plates and setae of segments 2-3 as usual. Typical tergal plates with posteroapical setae sword shaped; sternal plates with more lateral posteroapical setae sword shaped, medial setae of these plates smaller, thin; several setae off plates ventrally. Paratergal plates (Fig. 40, female) III-VI with quadrate, weakly fluted apical lobes; III with 2 apical setae, one extending beyond apical lobes; IV-VI with 1 seta about to apex of lobes, other minute. Plate VIII lacking apical lobes. Plates VII-VIII with usual pair of long apical setae. *Aedeagus* (Fig. 35). Pseudopenis extending well beyond apices of parameres, medially flared, then slightly constricted, with a second slightly serrate expansion distad to the medial flare; apex narrow and acute.

FEMALE (Fig. 45): As male except in usual sexually dimorphic characters. Thoracic sternal

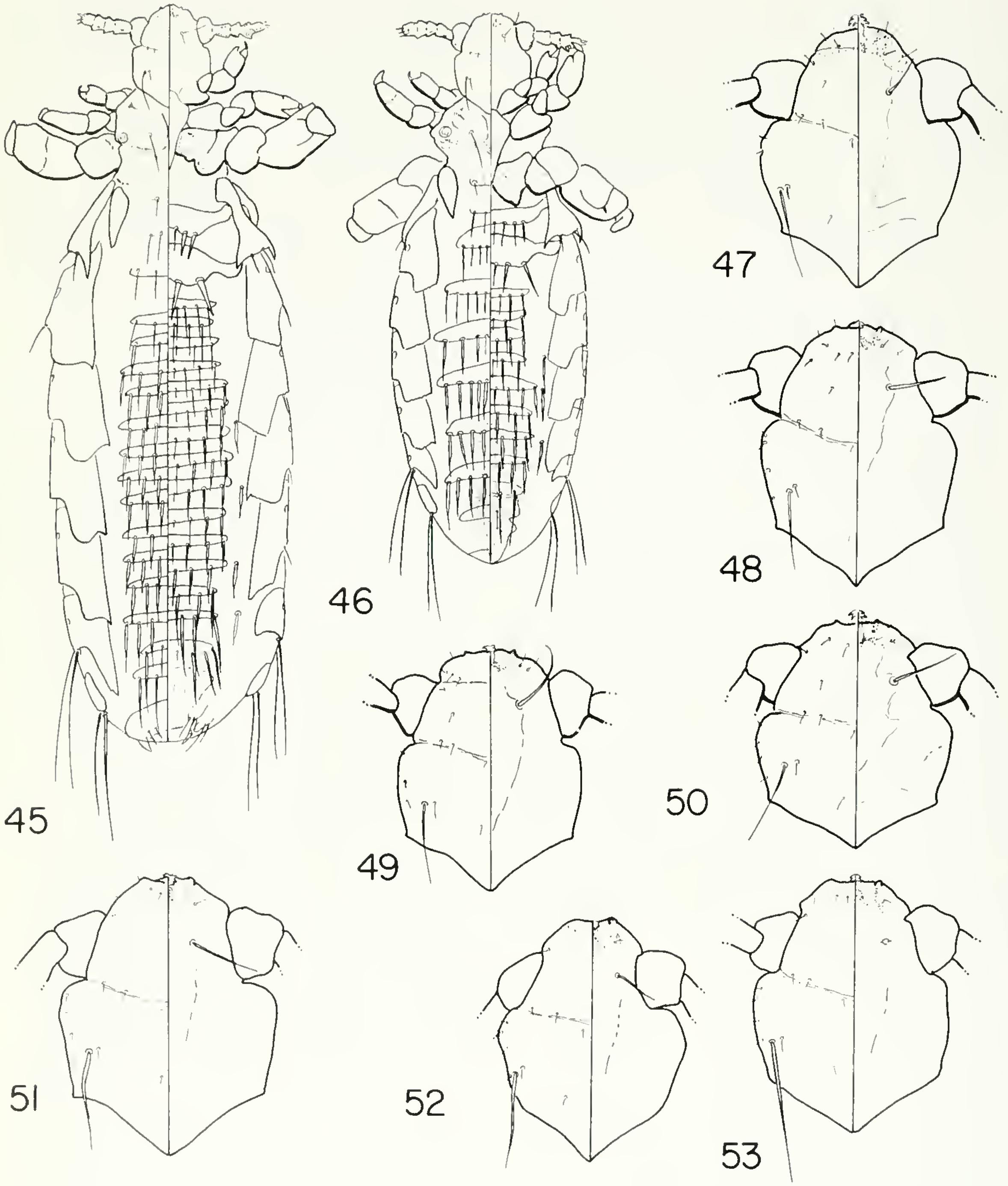


Fig. 45-53. *Hoplopleura travassosi* group. 45, *H. abeli*, new species, allotype; 46, same, holotype. Head, male: 47, *H. travassosi* Werneck, Uruguay; 48, same, ex *Oryzomys fulvescens* (SVP 13653); 49, *H. abeli*, holotype; 50, *H. rimae*, new species, holotype; 51, *H. cooki* Kim, allotype; 52, *H. similis* Kim, allotype; 53, *H. similis*, Mexico, from same collection as types.

plate sometimes blunt rather than acute. Apical setae of abdominal tergal plates broad, sword shaped; those of sternal plates sword shaped, smaller medially; several setae off abdominal plates ventrally. In female allotype second tergal plate of third abdominal segment appears to be missing, thus there are 18, rather than 19, abdominal tergal plates. This plate present in paratypes. Genital plate divided; genital seta short, bladelike.

6. *Hoplopleura rimae*, new species[°]

(Fig. 30, 36, 41, 50, 54-56, 57*a*)

Type Data: Male holotype, female allotype, 16 female and 6 male paratypes ex *Oryzomys minutus* (SVP 4190), Venezuela: Merida, 5 km S, 7 km E Tabay (near La Coromoto), 3375 m elev., 17-III-66, Peterson team collectors. There were 276 female and 205 male paratypes in 130 collections ex *Oryzomys minutus*, various localities in Merida, Tachira, Trujillo, Sucre, and Dto. Federal. The majority of collections were from Merida, near Tabay. There were 16 nymphs associated with the adults of the above collections.

Also Examined: From animals other than *O. minutus*, there were 23 specimens of *H. rimae*, new species, taken in 17 collections. Six of the collections and 10 of the specimens were from *Oryzomys albigularis* and *Oryzomys* species. These may represent natural occurrences; the other records were obviously either accidental or due to contamination of some sort.

Diagnosis

A member of the *travassosi* group. Close to *abeli*, new species, and *travassosi* Werneck. Among other characters, separable from *travassosi* by having 2 well-developed setae on paratergal plate III (Fig. 41) and from both *abeli* and *travassosi* in configuration of the tergal plates of abdominal segments 1-3 (Fig. 57*a*). In both sexes *rimae*, new species, the posterior margin of the tergal plate of segment 1 has a very distinctive fringe of elongate spicules; and the male has a close-set row of broad-based, finely drawn out setae on the tergal plate of abdominal segment 2 and the first plate of segment 3 (Fig. 57*a*), rather than larger, broadly separated setae in these positions. Further distinct from *abeli* in details of the male genitalia and setation of the abdominal tergal plates (Fig. 36, 55).

Lengths

Male holotype, 0.9 mm; female allotype, 1.2 mm; female paratypes, 1.15-1.3 mm; male paratypes, 0.85-0.95 mm.

Description

Male (Fig. 55): *Head* (Fig. 50). Anteriorly rounded, postantennal angles convex, not extended; posterolateral margins slightly convergent posteriorly; principal dorsal seta thin, its accessory seta set close to it. *Thorax*. Seta medial to mesothoracic spiracle long. Sternal plate (Fig. 30) bulbous anteriorly, posterior apex narrowly acute, with mesal keel. *Abdomen*. Tergal plate of segment 1 with posterior margin drawn out into a number of fine points, giving deeply scalloped appearance (Fig. 57*a*), its 2 posteromarginal setae rather small, set near posterolateral angles. Tergal plate of segment 2 and first plate of segment 3 each with close-set medial group of posteromarginal setae (9 in holotype) that are broad basally and rapidly drawn out into fine points (Fig. 57*a*). Second tergal plate of segment 3 and to a lesser extent, tergal plate of segment 4, with similar but more broadly spaced, longer setae. Remaining tergal plates with sword-shaped apical setae. Sternal plates with sword-shaped setae laterally, medial setae smaller, not sword shaped. Ventrally, 1 or 2 setae off posterior plates. Paratergal plates (Fig. 41, female) III-VI with 2 quadrate, slightly scaly apical lobes; plate III with 2 well-developed apical setae, 1 longer than lobes; plates IV-VI with 1 seta about one-half length of lobes and 1 seta minute. Plate VII with triangular dorsal lobe about same length as plate proper. Plates VII-VIII with usual pair of long setae. In one paratype, apical lobe of paratergal plate VII missing on one side, in a second paratype, both lobes of plate VII missing. These males were in a collection containing normal males taken near the type locality of the species. *Aedeagus* (Fig. 36) with parameres bent inward apically; pseudopenis strongly flared and serrate medially, posterior part narrowed to acute apex.

Female (Fig. 54): As male except in usual sexually dimorphic features and as follows: tergal plate of abdominal segment 2 and first plate of segment 3 each with 4 normal setae on posterior margin, placed in broadly separated pairs. Apical setae of more posterior tergal abdominal plates sword shaped; sternal plates with lateral setae sword shaped, medial ones smaller, thin; ventrally, 1 or more setae off posterior plates. Genital plate divided; genital seta short, acute, blade shaped.

Nymph (Fig. 56*a*, *b*): Both stages represented have head anteriorly flattened; principal dorsal head seta short, spinelike; other dorsal head setae small, not especially thickened. Anal lobe broad, rounded, or triangular apically;

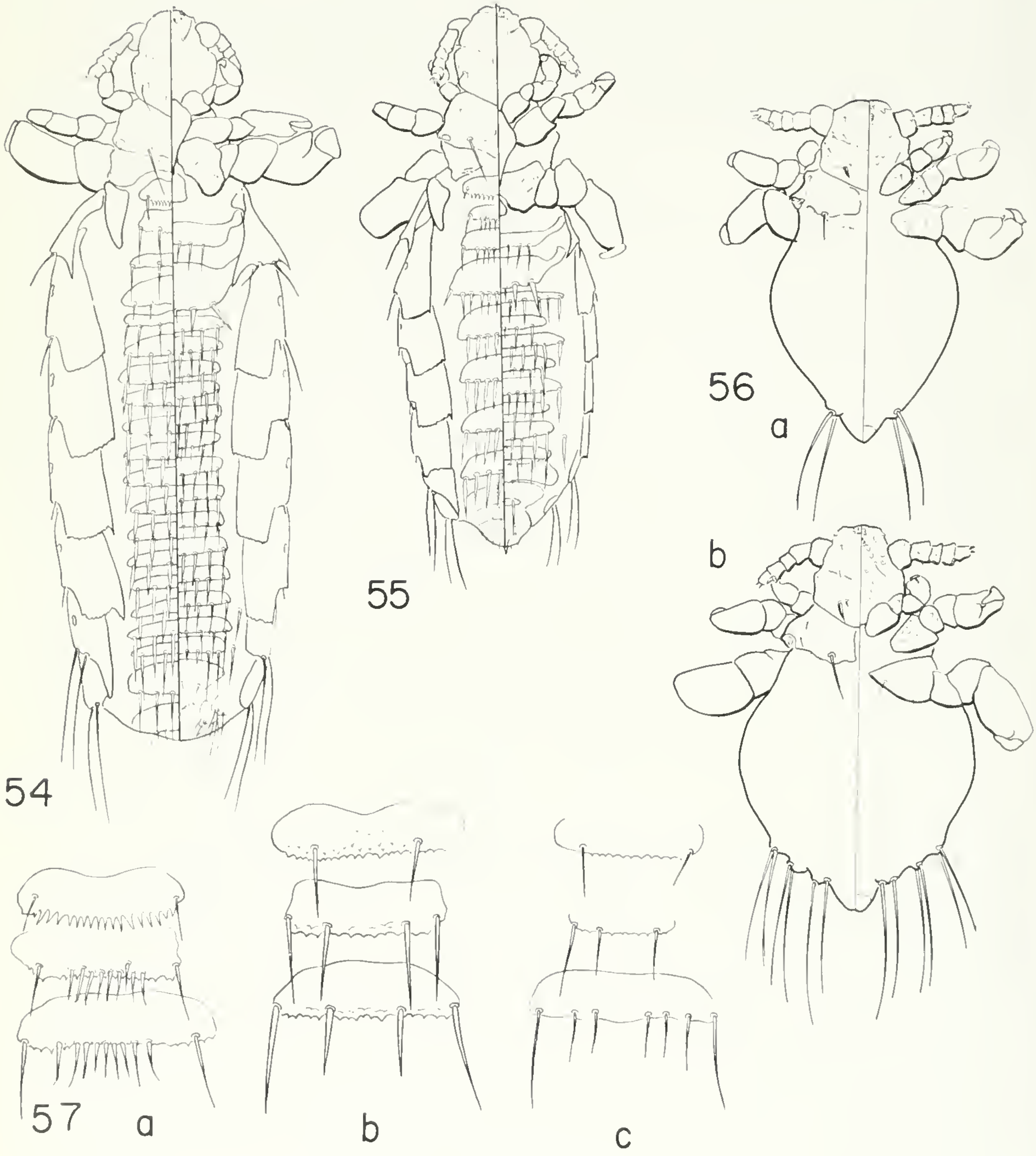


Fig. 54-57. *Hoplopleura travassosi* group. 54, *H. rimae*, new species, allotype; 55, same, holotype; 56, same, nymph, ex *Oryzomys minutus* (*a*, second instar [SVP 3958], *b*, third instar [SVP 3965]; 57 tergal plates of abdominal segments 1-3, male (*a*, *H. rimae*, holotype; *b*, *H. travassosi* ex *O. fulvescens* [SVP 13677], *c*, *H. abeli*, holotype).

ventral sclerotization of anal lobe is posteriorly evenly concave and does not extend as far posteriorly as dorsal sclerotization. Third instar (Fig. 56*b*) with 3 pairs terminal abdominal setae on each side, these set on tubercles. What is probably the second instar (Fig. 56*a*) has 1 pair terminal setae on each side and dorsal thoracic seta is not elongate.

7. *Hoplopleura angulata* Ferris*
(Fig. 58-59)

Hoplopleura angulata Ferris, 1921:73, Fig. 40, 41*a-c*, *e*. — Hopkins, 1949:470. — Ferris, 1951:129, 133.

The female holotype was from *Rhipidomys venezulae*, FCM 7048, Venezuela. Ferris also recorded the species from *Rhipidomys* sp., USNM 194500 (= *leucodactylus*, *fide* Hopkins, 1949), Peru; Río San Miguel; *Rhipidomys venustus*, USNM 137507, Venezuela; Merida; and *Thomasomys cinereus* FCM 19824, Peru; Balsas.

From the Ferris Collection, I have examined 2 females and 1 male ex *R. leucodactylus*, Peru; Río San Miguel. From Colombia I have seen one collection of 1 female and 2 males ex *Rhipidomys latimanus*, Department of Valle, Municipio de Cali, no. HTC-1337, H. Trapido collector (Rockefeller Foundation), and from Panama, 2 males ex *Nectomys sumichrasti*, Province of Chiriquí, Cerro Punta. *H. angulata* also occurs in Trinidad. I have examined one collection, supposedly from *Zygodontomys*. I suspect human error was involved in the host designation.

Venezuelan Records

One hundred eleven females, 77 males, 3 nymphs ex *Rhipidomys venustus* in 14 collections—including a collection of 83 females, 62 males, 3 nymphs (SVP 3889), Trujillo—from Dto. Federal, Trujillo, and Monagas; 1 female, 7 males ex *R. venezuelae* (SVP 546), Dto. Federal 3 km N Caracas, 1500 m elev.; 175 females, 117 males ex *R. couesi* (SVP 13343, 13450), Sucre, 7 km N 5 km E Güira, 4 m elev.; 13 females, 3 males ex *Rhipidomys macconnelli* in 10 collections, Bolivar and T. F. Amazonas; 26 females 27 males ex *Rhipidomys goodfellowi* (SVP 17224), T. F. Amazonas, 84 km SSE Esmeralda, 138 m elev.; 3 females ex *Rhipidomys caucensis* (SVP 8945). Bolivar, 85 km SSE El Dorado, 1032 m elev. There were also 12 other collections from *R. venezuelae*, *Oryzomys concolor*, and *Rhipidomys* species, including 31 females, 14 males, and 12 nymphs, from various localities in Tachira Falcon Bolivar and Lara.

Diagnosis

A member of the *travassosi* group. Distinct by having the postantennal angles of the head strongly extended and angulate, and with the posterolateral head margins very convergent posteriorly (Fig. 61). Further separable by a combination of the following: paratergal plates VII-VIII lack apical lobes (Fig. 60), the posterior apex of the thoracic sternal plate has the lateral margins straight and evenly convergent to the acute apex (Fig. 63-66), and the pseudopenis of the aedeagus is markedly angulate and serrate medially, with the lateral arms converging rapidly to a narrow, drawn-out apex (Fig. 62).

Lengths

Female, 1.5-1.8 mm; male, 1.1-1.2 mm.

Description

Male (Fig. 59): *Head* (Fig. 61). Anteriorly rounded; postantennal angles extended, angulate; posterolateral margins straight, strongly convergent posteriorly; principal dorsal seta stout, long, its accessory seta almost thornlike; other dorsal setae small, thin; first antennal segment large. *Thorax*. Seta medial to mesothoracic spiracle long; sternal plate (Fig. 63-67) of variable dimensions, rounded to almost angled anteriorly, rounded laterally, always posteriorly narrowing to acute apex that bears a mesal keel (this is not indicated in Fig. 64-67). *Abdomen*. Two ventral rows of setae and plates, and 1 dorsal row and plate per typical segment; sternal plates and setae of segments 2-3 arranged as usual; ventral setae long, thin, not sword shaped; tergal plate of segment 1 well developed, posterior margin bearing many short, fine, acute points, the 2 posteroapical setae broadly separated. Tergal plates of segments 2-5 with lateral posteroapical setae markedly longer than thin, acutely drawn out medial setae. Lateral setae of posterior segments especially somewhat inflated medially, none sword shaped. Ventrally, 1 seta off plate on either side on segment 7. Paratergal plates (Fig. 60, female) with II bearing acute dorsal and ventral apical lobes and 2 apical setae, 1 of them extending about to apex of lobes, and other beyond lobes; plates III-VI with squared dorsal and ventral lobes posteriorly serrate, slightly excavate, and drawn out laterally into short points; plate III with 2 stout apical setae, 1 extending beyond lobes, the other almost reaching apex of lobes. Plates IV-VI with 1 stout seta slightly shorter than apical lobes, and 1 minute seta. Plates VII-VIII lacking apical lobes; each with usual pair of long setae. *Aedeagus* (Fig. 62). Parameres with straight lateral margins, apices blunt; pseudopenis flared, angled and serrate medially; rapidly converging to narrow apex that extends well beyond parameres.

Female (Fig. 58): As male except for usual sexually dimorphic characters. Three sternal and 3 tergal plates per typical abdominal

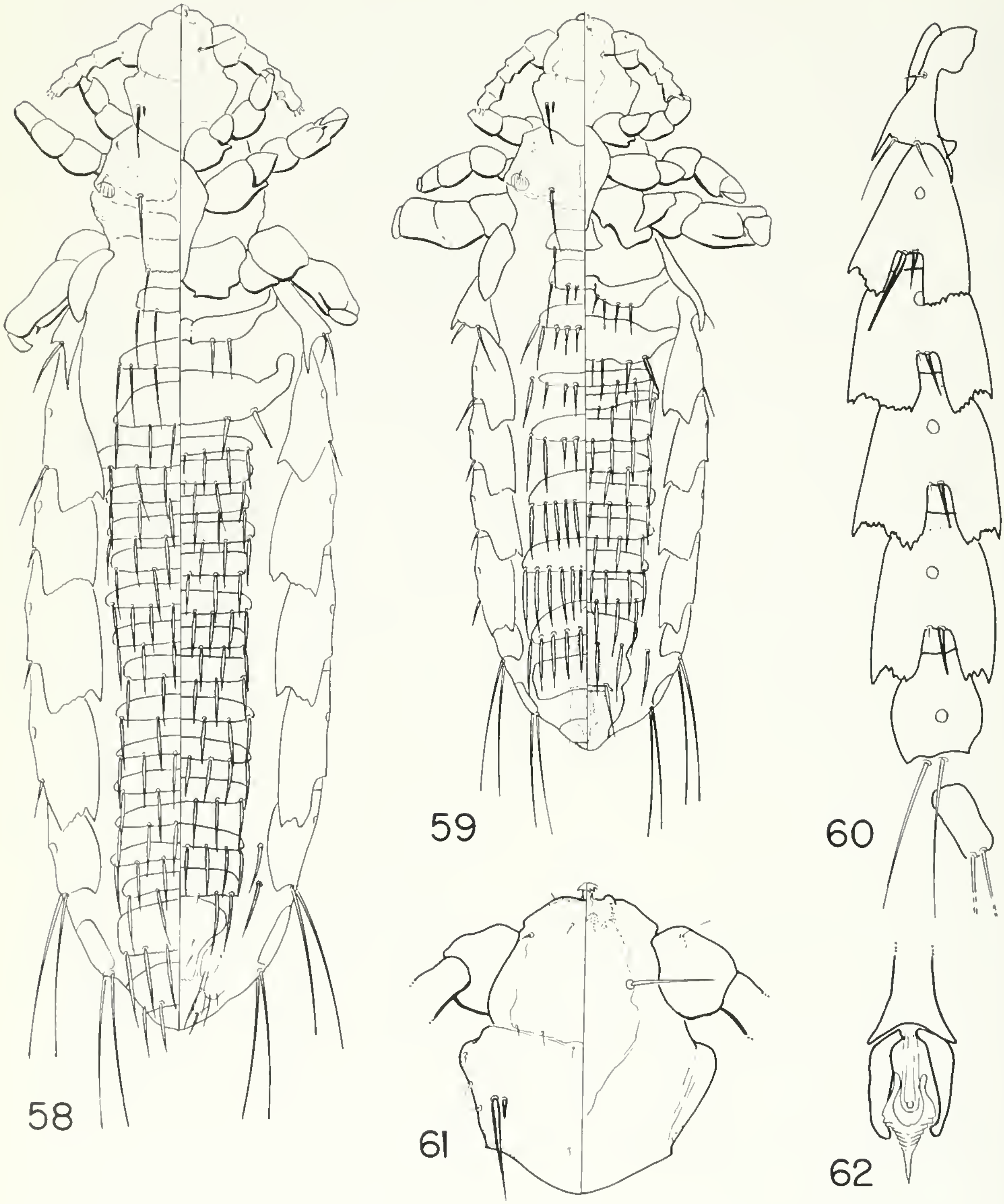
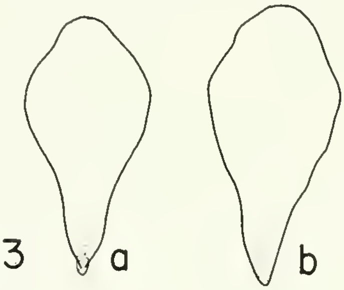
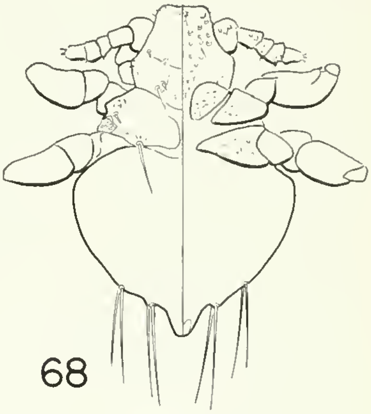


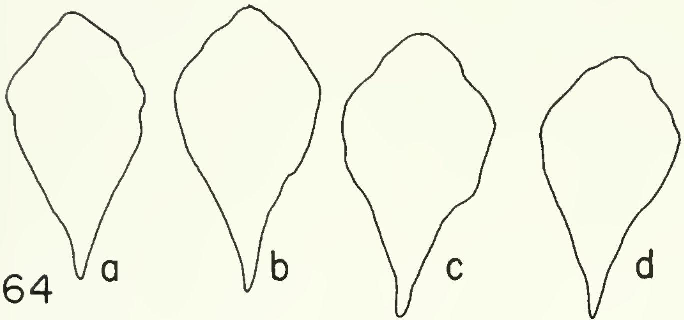
Fig. 58-62. *Hoplopleura angulata* Ferris, ex *Rhipidomys couesi* (SVP 13343). 58, female; 59, male; 60, paratergal plates, female; 61, head, male; 62, aedeagus.

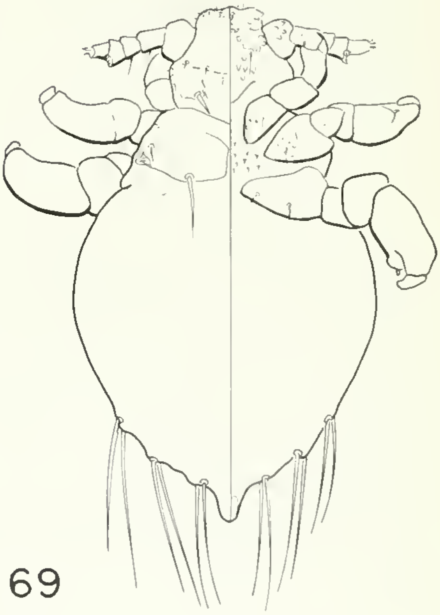
segment; abdominal setae somewhat inflated medially, not sword shaped; setae off plates ventrally on segment 7; genital plate divided; genital setae stout, short, blade shaped.

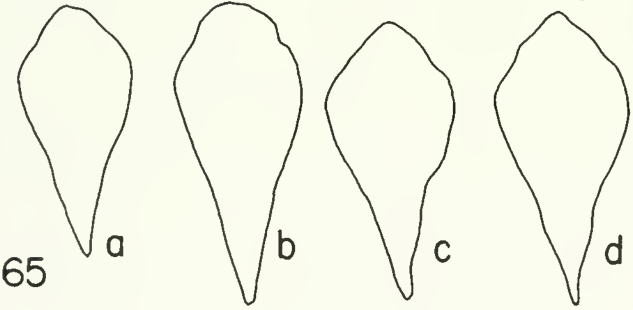
Nymph (Fig. 68, 69): Head of all stages with marked lateral postantennal angles; postantennal area very broad; principal and accessory dorsal head setae stout, thornlike; head and antennae tuberculate ventrally. Abdomen scaly, at times with pair of minute ventral setae near thorax, but sometimes these not evident. With short, narrow anal lobe that has ventral sclerotization shorter than dorsal one and excavate on each side so that it has medial point, appears scalloped. *Third instar* (Fig. 69). Usually with 3 pairs of terminal abdominal setae on each side, but in 1 specimen the most anterior seta is a single, not paired. *Second instar* (Fig.

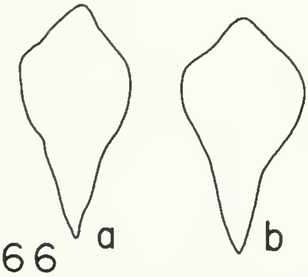

63


68


64


69


65


66

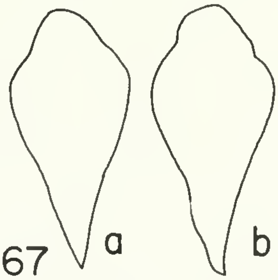

67

Fig. 63-69. *Hoplopleura angulata* Ferris. Thoracic sternal plates: 63, ex *Rhipidomys couesi* (SVP 13343) (*a*, male; *b*, female); 64, ex *R. goodfellowi* (SVP 17224) (*a* and *d*, male; *b* and *c*, female); 65, ex *R. couesi* (*a*, male, ex [SVP 13450]; *b*, female, same; *c*, male, ex [SVP 13343]; *d*, female, same); 66, ex *R. macconnelli* (SVP 8006) (*a*, male; *b*, female); 67, ex *R. venustus* (SVP 3832) (*a*, male; *b*, female); 68, nymph, second instar, ex *Rhipidomys* species (SVP 42802); 69, nymph, third instar, ex *Oryzomys concolor* (SVP 43870).

68). Has 2 pairs terminal abdominal setae; anterior pair represented by only a single seta in a single specimen from the same collection as abnormal third instar. *First instar.* Much as others. Posterior abdomen of only available specimen telescoped; thoracic dorsal setae very long; third pair of legs no larger than second; 2 long, stout, terminal setae on each side of abdomen.

Discussion

Few nymphs were taken in the Venezuelan survey, and most of them were from as yet undetermined species of *Rhipidomys*. Therefore, there is no way at present of evaluating the variation in setal numbers exhibited by 2 of the nymphs—from *R. venustus*, Trujillo (SVP 3889). Remaining nymphs were all from unclassified species of *Rhipidomys*. The adult *H. angulata* included in the present series do not vary consistently according to the host species except that the thoracic sternal plates appear to differ according to the host (Fig. 63-67).

H. angulata is the typical anopluran parasite of *Rhipidomys* species. Other species of sucking lice were taken from *Rhipidomys* so seldom that all such records may be considered due to straggling or error. Only 15 specimens of *angulata*, in 9 collections, were taken from Venezuelan mammals other than *Rhipidomys*, also demonstrating the strong relationship between the insect and its mammalian host.

8. *Hoplopleura indiscreta*, new species*
(Fig. 70-75)

Type Data: Male holotype, female allotype, 7 female and 2 male paratypes ex *Thomasomys lugens* (SVP 4442), Venezuela: Merida, 5 km E, 1 km S Tabay, 2710 m elev., 15-IV-66, Peterson collector; 2 male paratypes ex *T. lugens* (SVP 3813, 3971), Merida: 3 km W Timotes, 3172 m elev., 14-II-66, Peterson team collectors.

Also Examined: 1 female ex *Thomasomys laniger* (SVP 4133), Merida, 5 km S, 7 km E Tabay, 3250 m elev., 15-III-66, Peterson, Parrish, and Tipton collectors.

Diagnosis

A member of the *travassosi* group. Close to *angulata* Ferris and *travassosi* Werneck. Like *angulata*, the postantennal angles of the head are well developed and extended laterally (Fig. 74) though not as markedly as in *angulata*. Separable from *angulata* in that paratergal plate VII has a dorsal apical lobe (Fig. 72); the tergal plate of abdominal segment 2 has a close-set row of about 10 short setae with broad bases that are rapidly drawn into fine points (Fig. 71), and the aedeagus is different (Fig. 75). Like *travassosi* in having a lobe on paratergal plate VII. Differs from that species, among other characters, in the shape of the head and aedeagus, and by having 2 apical setae on paratergal plate III rather than only 1 short seta there. In the male, *indiscreta* is distinct from both *travassosi* and *angulata* by having only 1 long apical seta on paratergal plate VII.

Lengths

Male holotype, 1.0 mm; female allotype, 1.45 mm; female paratypes, 1.3-1.45 mm (one paratype female measured 1.15 mm owing to telescoping of the thorax and abdomen during mounting); male paratypes, 1.0-1.05 mm.

Description

Male (Fig. 71): *Head* (Fig. 74). Rounded anteriorly, first antennal segment large, third and fourth segments with spiniform setae dorsally. Postantennal angles marked; posterolateral margins straight, convergent posteriorly. Principal dorsal seta normal, not thickened, its accessory seta thin. *Thorax.* Seta medial to mesothoracic spiracle long. Sternal plate (Fig. 73) rounded anteriorly, slightly bulbous laterally, posterior apex acute but not narrowly so, bearing mesal keel. *Abdomen.* Tergal and sternal plates large; 1 dorsal and 2 ventral plates per typical segment; sternal plates and setae of segments 2-3 arranged as usual. Tergal plate of segment 1 strongly spiculate, its posterior margin serrate, bearing 1 small posteromarginal seta at each posterolateral corner. Tergal plate of segment 2 and first plate of segment 3 with posteroapical row of about 10 short, broad-based setae drawn into thin points; these setae flanked at posterolateral corners by 1 longer, normal seta. Posteromarginal setae on succeeding tergal plates longer, somewhat inflated medially, lateral posteromarginal setae of sternal plates slightly sword shaped. No setae off abdominal plates. Paratergal plates (Fig. 72, female) with II having both apical angles acute and with 2 apical setae about as long as lobes; plates III-VI with squared dorsal and ventral apical lobes that have posterior margins fluted or pleated in appearance; plate III with both apical setae well developed; plates IV-VI with 1 well-developed seta not reaching apex of lobes, plus a small seta (larger seta is relatively longer in male than in female); plate VII with narrowed truncate dorsoapical lobe and only 1 long apical seta; plate VIII lacking lobes, with usual pair of long apical setae. *Aedeagus* (Fig. 75). Elongate, parameres slightly convex laterally,

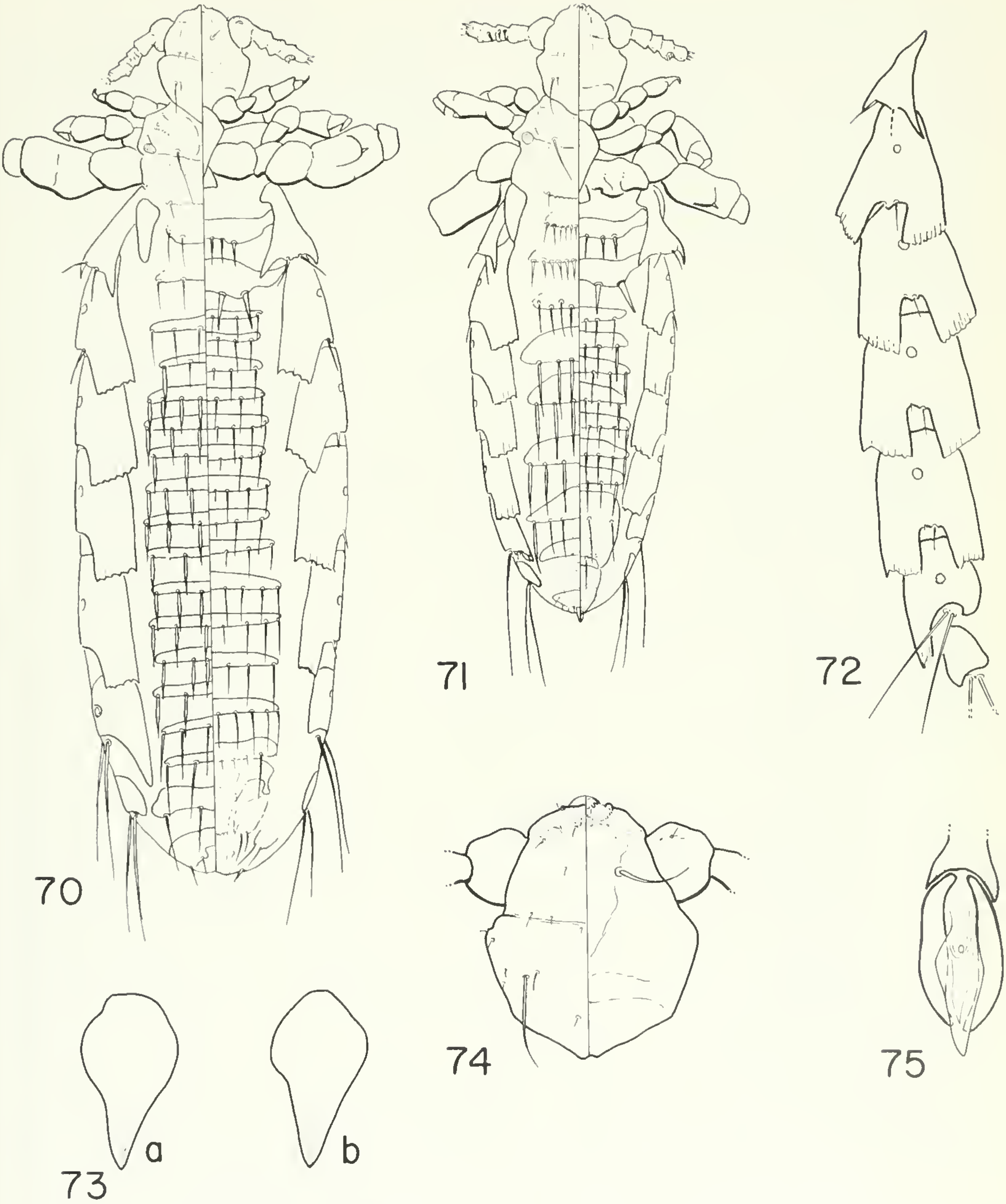


Fig. 70-75. *Hoplopleura indiscreta*, new species. 70, allotype; 71, holotype; 72, paratergal plates, allotype; 73, thoracic sternal plate (*a*, holotype; *b*, allotype); 74, head, holotype; 75, aedeagus, holotype.

pseudopenis not flared, smoothly and evenly convex laterally, lacking lateral serrations, posterior apex rather broad.

Female (Fig. 70): As male except in sexually dimorphic features. Dorsal setae of antennal segments 3-4 not enlarged; setae of paratergal plates not extending close to apex of lobes, plate VII with usual pair of long setae; 3 sternal and tergal plates per typical abdominal segment; sword-shaped setae on dorsal plates, ventral setae thinner; genital plate divided; genital seta short, stout, bladelike.

9. *Hoplopleura tiptoni*, new species°
(Fig. 76-82)

Type Data: Male holotype, female allotype, 2 female paratypes ex *Thomasomys laniger* (SVP 4050), Venezuela: Merida, 4 km S, 6.5 km E Tabay (La Coromoto), 3170 m elev., 12-III-66, Peterson, Parrish, and Tipton collectors; 1 male paratype (SVP 4111), as above but 3185 m elev., 15-III-66; 1 female, 1 male paratypes (SVP 4089), as above but 3180 m elev., 13-III-66; 1 female, 2 male paratypes (SVP 4100, 4101), as above

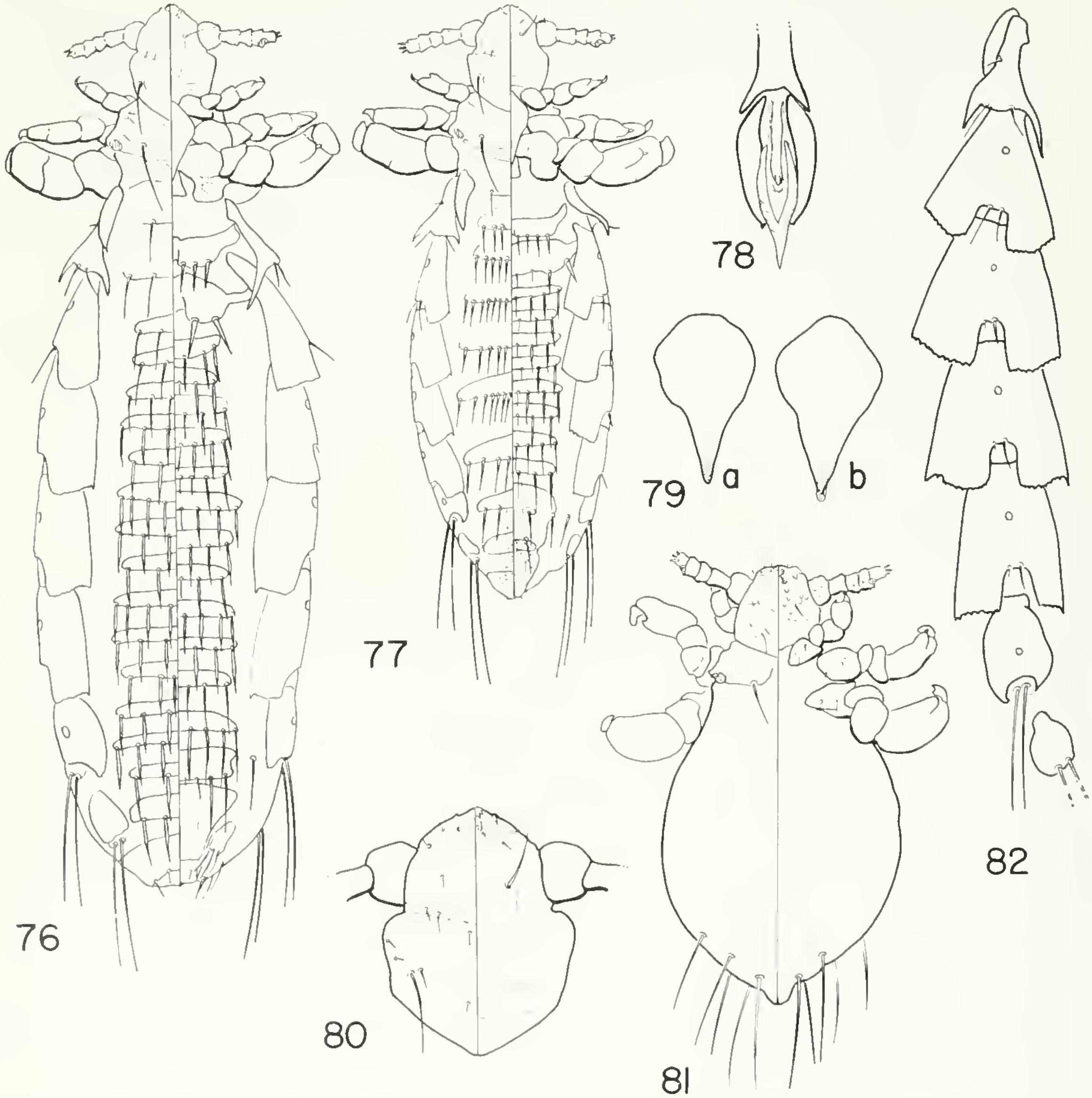


Fig. 76-82. *Hoplopleura tiptoni*, new species, ex *Thomasomys laniger*. 76, allotype; 77, holotype; 78, aedeagus, holotype; 79, thoracic sternal plate (*a*, male paratype [SVP 4111]; *b*, allotype); 80, head, holotype; 81, nymph, third instar (SVP 4101); 82, paratergal plates, allotypes.

but 5 km S, 7 km E Tabay, 3210 m elev., 14-III-66; 4 female paratypes (SVP 4300), as above but 7.5 km E, 6 km S Tabay, 3560 m elev., 21-III-66, Peterson team collectors.

Also Examined: 1 male ex *Akodon urichi* (SVP 143), Dto. Federal, 3 km N Caracas, 1630 m elev., 23-VII-65, Peterson and Tuttle collectors; 1 male ex *Oryzomys minutus* (SVP 4083), Merida, 4 km S, 6.5 km E Tabay (La Coromoto), 3160 m elev., 13-III-66, Parrish and Tipton collectors.

DIAGNOSIS

A member of the *travassosi* group. Closely related to *angulata* Ferris and, like that species, lacking apical lobes on paratergal plate VII. A smaller species than *angulata*. Distinct in that the postantennal angles of the head are not enlarged and extended laterally (Fig 80); the thoracic sternal plate is bulbous laterally rather than being elongate and evenly narrowing posteroapically (Fig. 79); the pseudopenis is not flared medially or strongly serrate (Fig. 78); and the dorsal setation of the male abdomen is different (Fig. 77). Also closely related to *H. torresi* Ronderos and Capri (known from a single female ex *Oryzomys flavescens*, Argentina). Differing from that species by having 2 well-developed setae on paratergal plate III, rather than only 1; and the setae of the tergal plate of abdominal segment 1 are small and thin, rather than being about as large as the other dorsal abdominal setae. In the nymph, *tiptoni* differs from *angulata* in that the principal dorsal head seta and other dorsal head setae of *tiptoni* are not short, stout, or thornlike, and the postantennal region of the head is not strongly broadened (Fig. 81).

LENGTHS

Male holotype, 0.95 mm; female allotype, 1.5 mm; female paratypes, 1.3-1.45 mm; male paratypes, 0.95-1.0 mm.

DESCRIPTION

MALE (Fig. 77): *Head* (Fig. 80). Anteriorly slightly projecting, narrowly rounded; postantennal angles marked; lateral postantennal margins only slightly convergent posteriorly. Principal dorsal seta long, its accessory seta on same horizontal plane; no dorsal setae minute. *Thorax*. Seta medial to mesothoracic spiracle long. Sternal plate (Fig. 79) rounded anteriorly, laterally bulbous, rapidly narrowed to acute posterior apex which has mesal keel. *Abdomen*. Tergal plate of segment 1 indicated but not complete, bearing 2 thin, short posteroapical setae; other sternal and tergal plates as usual; sternal plates of segments 2-3 normally modified. One tergal and 2 sternal plates per typical segment; tergal plates with close-set rows of setae that are slightly inflated medially and drawn out into fine points; apical setae of sternal plates less numerous, slightly sword shaped; no setae off plates dorsally or ventrally. Paratergal plates (Fig. 82, female) with III-VI scaly, with truncate apical lobes; plate III with 2 apical setae about as long as lobes; plates IV-VI each with 1 seta less than length of lobes plus 1 small seta; plates VII-VIII lacking apical lobes, with usual pair of long apical setae. *Aedeagus* (Fig 78). Elongate; parameres slightly convex; pseudopenis not sharply angled laterally, not strongly serrate, with narrowly triangular apex.

FEMALE (Fig. 76): As male except for usual sexually dimorphic characters. Typical abdominal segments each with 3 sternal and 3 tergal plates, their apical setae slightly sword shaped, no setae off plates in allotype, sometimes 1-2 off plates ventrally in paratypes. Genital plate divided; genital seta short, bladelike.

NYMPH (Fig. 81): Only third stage represented. Head broad, flattened anteriorly, no dorsal setae thornlike, principal dorsal seta well developed, other dorsal setae small but not minute. Abdomen scaly, a single and 2 pairs terminal abdominal setae on each side. Anal segment scarcely prolonged. Abdomen of only specimen broken; drawing approximates its normal state.

This species is named for one of the directors of the Venezuelan mammal-ectoparasite survey, Dr. V. J. Tipton, in recognition of his long and fruitful association with the taxonomy and biology of ectoparasites.

10. *Hoplopleura handleyi*, new species°

(Fig. 83-89)

TYPE DATA: Male holotype, female allotype, 7 female and 1 male paratypes ex *Neacomys tenuipes* (SVP 91), Venezuela: Dto. Federal, 3 km N Caracas, Los Venados, 1465 m elev., 22-VII-65, Peterson and Tuttle collectors.

DIAGNOSIS

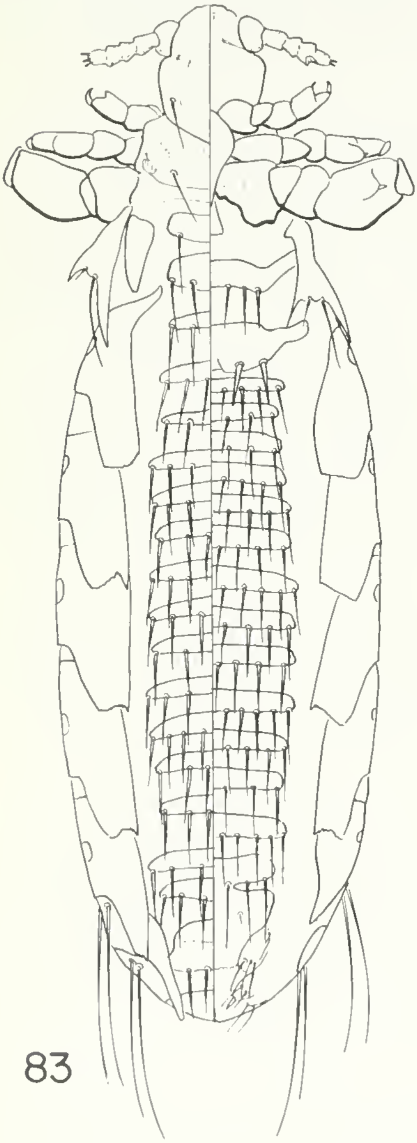
A member of the *travassosi* group. Closest to *brasiliensis* Werneck but much less heavily sclerotized than that species. Female like *brasiliensis* in having the genital plate joined medially, rather than being separated into plates as is true in all other members of this group. The male, like *brasiliensis*, has all setae on the tergal abdominal plates drawn out into thin points (Fig. 84). Separable from *brasiliensis* by having only 1 apical lobe on paratergal plate VIII, and with a long seta medial to the mesothoracic spiracle.

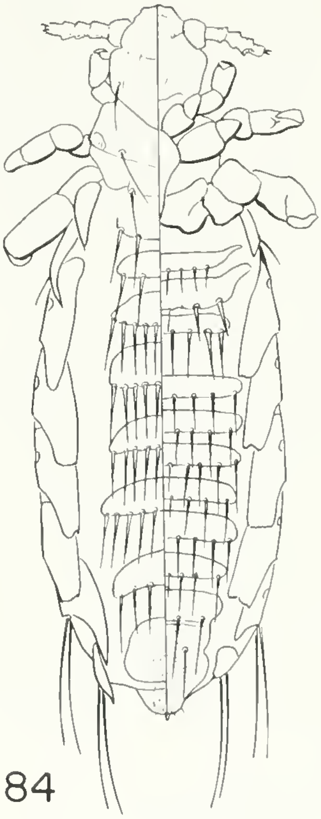
Lengths

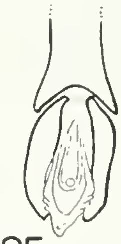
Male holotype, 1.1 mm; female allotype, 1.5 mm; female paratypes, 1.4-1.5 mm; male paratypes, 1.1 mm.

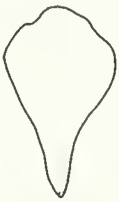
Description

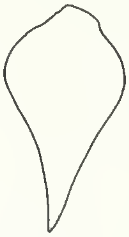
Male (Fig. 84): *Head* (Fig. 88). Anteriorly slightly projecting, truncate; postantennal angles rounded; posterolateral margins slightly convex; principal dorsal seta set quite near lateral margin, its accessory seta and other dorsal setae minute. *Thorax.* Seta medial to mesothoracic spiracle long. Sternal plate (Fig. 86) rounded, almost bulbous anteriorly; posterior apex acute, with mesal keel. *Abdomen.* Tergal plate of segment 1 with 2 large posteromarginal setae. Posteromarginal setae of remaining tergal plates all large, long, drawn out into very thin points. Setae of sternal plates also drawn into thin points. No setae off abdominal plates.

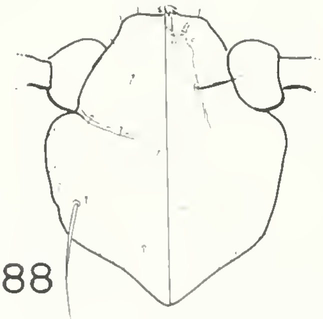

83


84


85


86


87


88

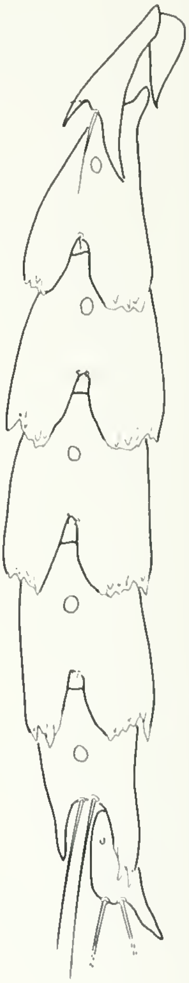

89

Fig. 83-89. *Hoplopleura handleyi*, new species. 83, allotype, 84, holotype; 85, aedeagus, holotype; 86, thoracic sternal plate, holotype; 87, same, allotype; 88, head, holotype; 89, paratergal plates, allotype.

One tergal and 2 sternal plates per typical segment, these plates well developed. Sternal plates of segments 2-3 as usual in genus. Paratergal plates (Fig. 89, female) scaly, III-VI with 2 long apical lobes, bay between lobes narrow; plate VII with 2 acute apical lobes; plate VIII with single, acute, dorsoapical lobe, this lobe missing on one side in holotype. Plate II with 1 small seta and 1 seta reaching apex of lobes; plate III with 1 minute apical seta; plates IV-VI with 2 minute setae; plates VII-VIII with usual pairs of long setae. *Aedeagus* (Fig. 85). Pseudopenis flared medially, with lateral margins weakly serrate; turned up apically, but apex apparently acute.

FEMALE (Fig. 83): Essentially as male except in sexually dimorphic characters. Thoracic sternal plate elongate-acute posteriorly (Fig. 87); all abdominal setae large, tapering to long acute points; no setae off plates. Genital plate joined medially; genital seta short, blade shaped.

This species is named for Dr. C. O. Handley, Jr., U.S. National Museum, in recognition of his outstanding contributions to the study of Central and South American mammals and their ectoparasites.

11. *Hoplopleura brasiliensis* Werneck
(Fig. 90-95)

Hoplopleura brasiliensis Werneck, 1932*a*:754, Fig. A, B.—Werneck, 1932*b*:235. — Ferris, 1951:126, 134.

The female holotype, male allotype, and a series of female and male paratypes were taken from a "wild rat" (species and genus unknown), Brazil: State of Goyaz.

H. brasiliensis was not taken during the Venezuelan surveys. However, its presence in neighboring Trinidad and in Brazil on *Oryzomys capito*, which also occurs in Venezuela, suggests that it probably occurs in Venezuela as well. In Trinidad *H. brasiliensis* is a typical parasite of *O. capito*, and from Dr. Aitken I have 13 collections of this species from *O. capito*. Dr. Aitken also collected 20 females and 8 males of *brasiliensis* in 3 collections ex *O. capito*, Brazil: Amapá Territory.

DIAGNOSIS

A member of the *travassosi* group. Most aberrant of the group. Separable in both male and female from other South American members of the group by having a very small seta medial to the mesothoracic spiracle; 2 well-developed apical lobes on paratergal plate VIII (Fig. 95); and the head as broad as long, with the heavily sclerotized postantennal margins parallel, the principal dorsal head seta very near the lateral margin, with its small accessory seta just anterior, rather than medial, to the principal seta (Fig. 94). *H. brasiliensis* is closest to *handleyi*, new species, from *Neacomys*.

LENGTHS

(Brazilian specimens) female, 1.55-1.7 mm; male, 1.35-1.4 mm.

DESCRIPTION

FEMALE (Fig. 90): A well-sclerotized, large species. *Head* (Fig. 94, male). As broad as long, posterolateral margins parallel, strongly sclerotized; all dorsal setae except principal dorsal seta minute. Principal dorsal seta set very near lateral margin of head. *Thorax*. Seta medial to mesothoracic spiracle very small, near spiracle. Sternal plate (Fig. 92) triangular anteriorly with long, acute posterior apex that has an indication of a mesal keel. *Abdomen*. Sternal plates and setae of segments 2-3 as usual in genus. Typical segments each with 3 large, faintly scaly tergal and sternal plates, their apical setae stout, sharply pointed, not sword shaped. No setae off plates. First segment with well-developed tergal plate bearing 2 apical setae similar to other abdominal setae. Paratergal plates (Fig. 95) faintly scaly; III-VII with 2 quadrate apical lobes with deeply serrate posterior margins; plate III with 1 small apical seta; plates IV-VI with 2 small setae, dorsal one minute; plate VIII with 2 long acute, subequal apical lobes. Tergal plate of segment 8 with 9-11 large, close-set posteroapical setae. Genital plate joined medially; genital seta not strongly flattened.

MALE (Fig. 91): As female except in sexually dimorphic characters. Dorsally 1 or 2 setae on antennal segments 3-4 enlarged, thornlike. One tergal and 2 sternal plates per typical abdominal segment. Tergal plate of first abdominal segment with the 2 apical setae rather short, stout. Typical tergal plates with close-set rows of 10-14 setae that are stout at base and drawn out apically to sharp points. Setae of sternal plates stout, acutely pointed, not as drawn out. No setae laterally off plates. *Aedeagus* (Fig. 93). Elongate; parameres only slightly convex laterally; pseudopenis serrate laterally, blunt tip extending only slightly beyond parameres.

12. *Hoplopleura exima*, new species°
(Fig. 96-100)

TYPE DATA: Unique male holotype ex *Anotomys trichotis* (SVP 21973), Venezuela: Tachira, 35 km S, 22 km W San Cristobal (Buena

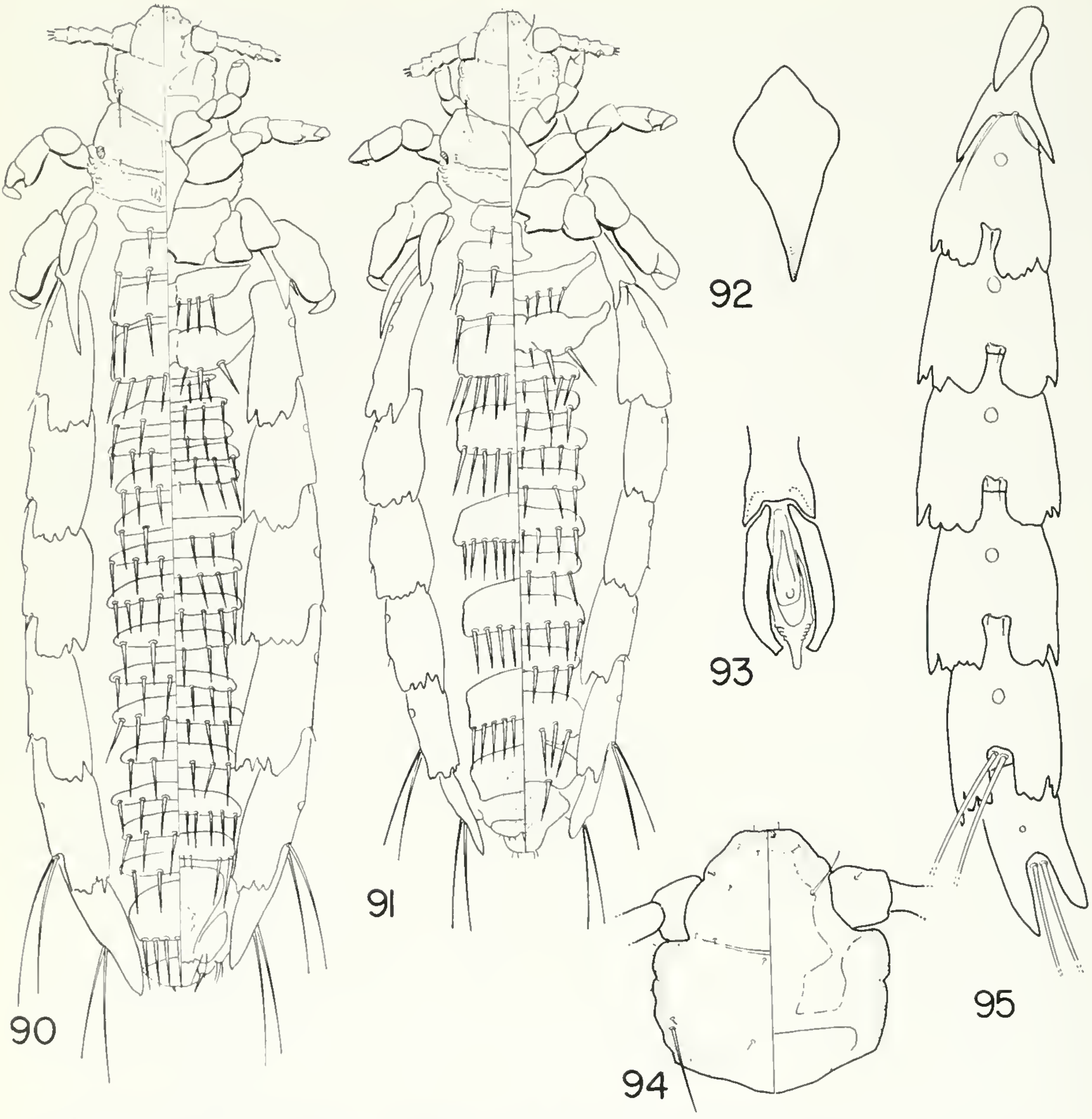


Fig. 90-95. *Hoplopleura brasiliensis* Werneck, Brazil ex *Oryzomys capito*, RO-8610. 90, female; 91, male; 92, thoracic sternal plate, female; 93, aedeagus; 94, head, male; 95, paratergal plates, female.

Vista), 2400 m elev., 24-III-68, Peterson team collectors. *Anotomys trichotis*, a water rat, is known from only a few specimens and the present individual was the only one taken during the Venezuelan surveys. Dr. Handley (private communication) says that *Anotomys*, although a cricetine, is morphologically and ecologically far removed from the other hosts of the *Hoplopleura* species known from Venezuela.

Diagnosis

A member of the *travassosi* group. Like *angulata* Ferris in lacking apical lobes on paratergal plate VII (Fig. 99), but separable in that the postantennal angles of the head are not extended (Fig. 100). Distinct from all members of the *travassosi* group because the apical lobes of the paratergal plates have their apices set diagonally, with the bay between them much broader apically than basally.

Length

1.1 mm.

Description

Male (Fig. 96): *Head* (Fig. 100). Rounded anteriorly; postantennal angles rounded, not extended; posterolateral margins straight, slightly convergent posteriorly; principal dorsal seta normal in size and position, its accessory seta larger and stouter than other dorsal setae. *Thorax*. Seta medial to mesothoracic spiracle long. Sternal plate (Fig. 97) rather blunt posteroapically, with indistinct mesal keel. *Abdomen*. Tergal plate of first segment indistinct, its 2 posteroapical setae long. Typical segments each with 2 sternal and 1 tergal plates; sternal plates of segments 2-3 arranged as usual. No dorsal setae sword shaped. Ventral setae similar, smaller to middle of rows. Paratergal plates (Fig. 99) with both apical setae of II well developed, 1 reaching apices of lobes; plate III with both apical setae extending beyond apices of lobes; plates IV-VI with 1 seta extending to apices of lobes, other minute. Apical lobes of III-VI quadrate, angled outward so that apex of each lobe set diagonally, and bay between lobes broadened distally. Plates

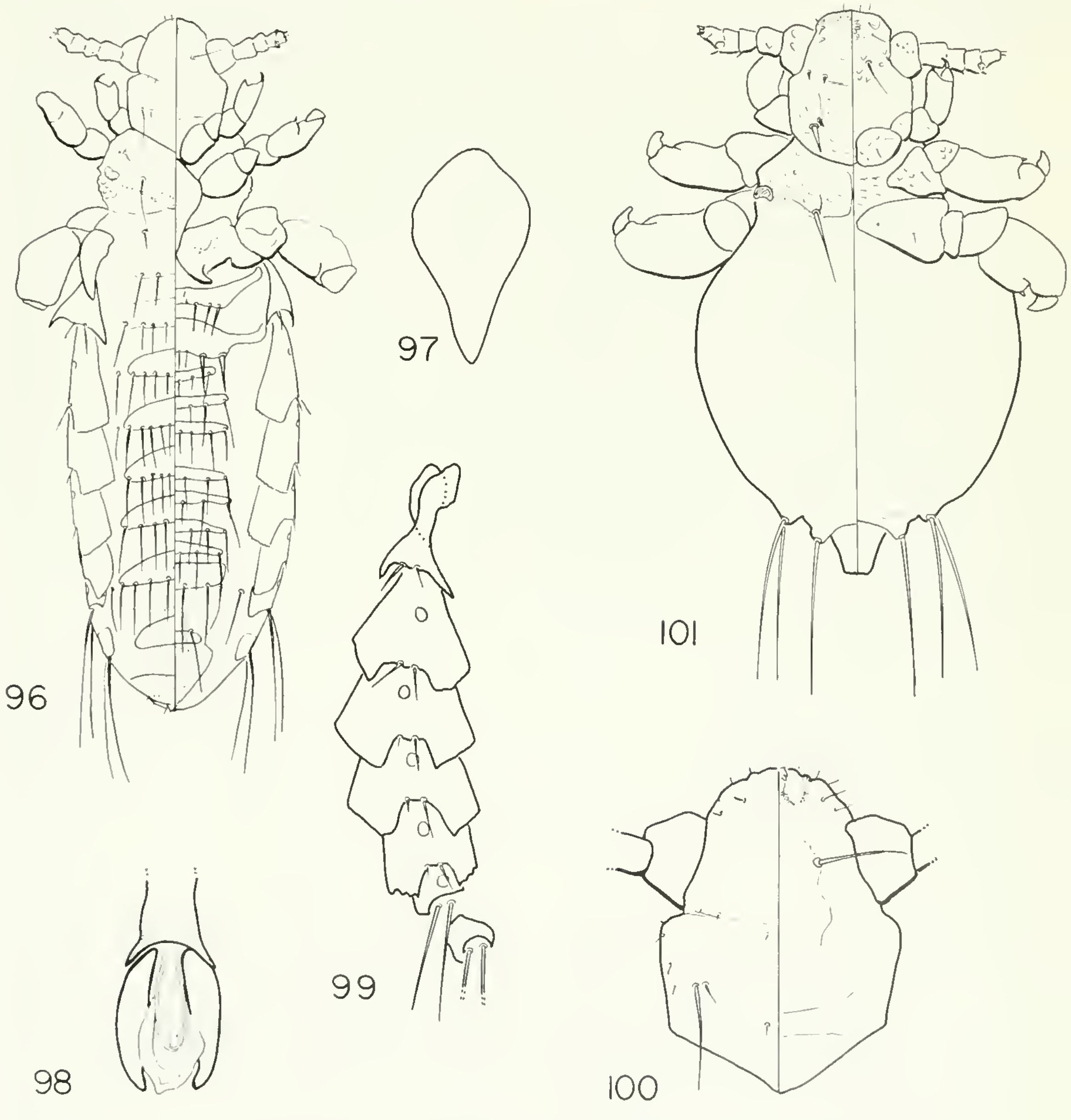


Fig. 96-101. *Hoplopleura* species. 96, *Hoplopleura exima*, new species (male) (*travassosi* group), ex *Anatomys trichotis* (SVP 21973); 97, same, thoracic sternal plate; 98 same, aedeagus; 99, same, paratergal plates; 100, same, head, 101, *H. quadridentata* (Neumann), nymph, third instar, ex *Nectomys squamipes* (SVP 41964).

VII-VIII lacking apical lobes, each with usual long pair of setae. *Aedeagus.* In poor condition in only specimen, as in Fig. 98.

13. *Hoplopleura quadridentata* (Neumann)°

(Fig. 101-107)

Haematopinus (*Polyplax*) *quadridentatus* Neumann, 1901:5, Fig. 13, 14.

Hoplopleura (?) *quadridentatus*, Kellogg and Ferris, 1915*a*:155.

Hoplopleura quadridentata, Ferris, 1916:156 (*partim*, not records from Galapagos).—Ferris, 1921:87, Fig. 52, 53 (*partim*, not records from *Oryzomys*).—Pratt and Lane, 1951:142, Fig. 4.—Ferris, 1951:127, 142 (*partim*).

The types of *quadridentata* were from *Nectomys squamipes* (as *Holochilus*), "Haut Peru." *H. quadridentata* has been recorded by Ferris from *Nectomys squamipes*, Paraguay: Sapucay, and from *N. squamipes palmipes*, Trinidad. Ferris also recorded the species from *Oryzomys melanotis rostratus*, USNM 92935, Mexico: Tamaulipas, Alta Mira, and *Oryzomys fulvescens*, USNM 58259, Mexico: Vera Cruz, Orizaba. The specimens from *O. fulvescens* are, in part, *H. similis* Kim and, in part, *H. nesoryzomydis* Ferris. I have not seen the specimens from *O. melanotis rostratus* but suspect they also may be *nesoryzomydis*. *H. quadridentata* was the typical anopluran parasite of *Nectomys squamipes palmipes* in Dr. Aitken's collections from Trinidad.

Venezuelan Records

There were 33 females, 15 males, and 16 nymphs in 10 collections ex *Nectomys squamipes*, Bolivar, Monagas, T. F. Amazonas, and Zulia, including a single collection of 22 females, 22 males, and 5 nymphs (SVP 30781), T. F. Amazonas. One male was collected from *Holochilus brasiliensis* (SVP 13178) Monagas.

Diagnosis

The Venezuelan specimens of *quadridentata* agree well with the description in Ferris (1921) except in the preantennal width, which depends upon position and flattening during mounting, and in that the Venezuelan females often lack setae off the abdominal plates. In the adult, *H. quadridentata* may be separated from related species by the marked rugosity or scaliness of head, thoracic, and major abdominal plates, in that the first antennal segment is normal, not enlarged, there are 1 long and 1 minute apical setae on paratergal plate III; and there are 4 subequal apical lobes on paratergal plates III-VI, and 2 apical lobes on paratergal plate VII. The male genitalia are slightly longer, in proportion to their width than in other members of group except *H. multilobata* Werneck.

Lengths

Female, 1.1-1.25 mm; male, 1.05 mm.

Redescription

Male (Fig. 103): *Head* (Fig. 106). Dorsally rugose, anteriorly broadly rounded; posterolateral margins parallel, slightly convex; all dorsal setae except principal one very small to minute. *Thorax.* Well sclerotized dorsally, rugose or scaly; seta medial to mesothoracic spiracle long. Sternal plate (Fig. 105) triangulate anteriorly, posterior part rapidly narrowing to indented-truncate apex, posterolateral margins concave. *Abdomen.* Tergal plate of segment 1 present, lacking setae; typical terga (below third segment) each with 1 narrow, strongly sclerotized plate, posteromarginal setae slightly inflated medially. Typical sterna with 2 plates per segment, posteromarginal setae sword shaped. Sternal plates of segments 2-3 arranged as usual in genus. Paratergal plates (Fig. 107, female) scaly; II with 1 stout long apical seta; III with 1 long and 1 minute setae; IV-VI with 2 minute apical setae. Plates III-VI with dorsal and ventral apical lobes deeply and evenly subdivided, VII with 2 undivided apical lobes; VIII lacking lobes. *Aedeagus* (Fig. 104). With pseudopenis broadly flared, not angulate medially, serrate laterally; parameres broadest subapically, their apices recurved, acute.

Female (Fig. 102): As male except for usual sexual dimorphism. Typical abdominal terga and sterna each with 3 narrow, well-sclerotized plates, their apical setae not strongly sword shaped or particularly inflated medially, none off plates. Genital plate entire but excavated laterally on each side; genital seta stout, long.

Nymph (Fig. 101): *Third instar.* Principal dorsal head seta stout, short; other dorsal head setae very short, almost thornlike except lateral ones which are extremely minute. Head and thorax dorsally scaly. Three terminal setae on each side of abdomen; anal lobe somewhat prolonged. *Second instar.* Similar but smaller, with only 1 terminal seta per side. *First instar.* Not represented in the collections. The stoutness of the principal dorsal head seta together with the scaliness of head and thorax distinguish nymphs of *quadridentata* from others known in this group.

Discussion

H. quadridentata may serve as type of a group of species that occur in North, Central, and South America on species of the cricetine rodents *Oryzomys*, *Zygodontomys*, *Holochilus*, and *Nectomys*. The *quadridentata* group, a part of the *hesperomydis-affinis* complex, is characterized by the following: the thoracic sternal plate is prolonged posteriorly but always has the apex blunt or rounded, not acute; the antenna is not sexually dimorphic except the male often has the dorsal setae of segments 3-4 enlarged. The most noticeable attribute is the tendency of the paratergal plates to have the apical lobes deeply subdivided so there are 4 subequal rounded or somewhat acute apical lobes, and, also, the apical setae of paratergal plates IV-VI are minute, and on plates II-III there is always at least 1 long seta. Abdominal setae of the typical segments vary from thin to sword shaped but are never as strongly flattened and broadened medially as in certain other groups of the genus. A tergal plate may be developed on the first abdominal segment

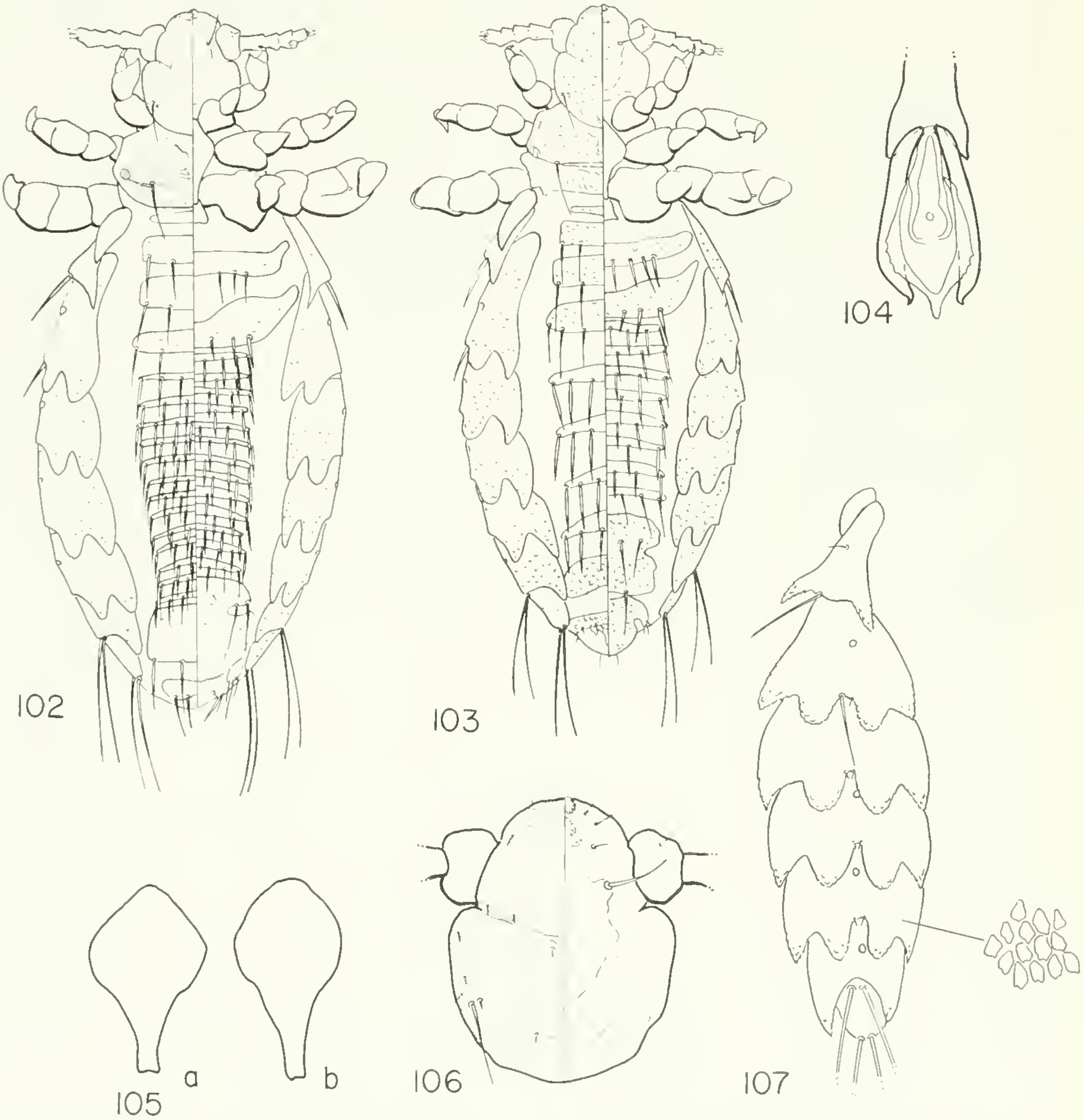


Fig. 102-107 *Hoplopleura quadridentata* (Neumann). Ex *Nectomys squamipes* (SVP 12429): 102, female; 103, male; 104, aedeagus; 105 thoracic sternal plate (*a*, male, *b*, female); 106, head, male. Ex *Nectomys squamipes* (SVP 30784): 107, paratergal plates, female.

but, if so, there are no setae on the posterior margin. The pseudopenis has a short posterior apex and the arms are serrate and flared medially. Nymphs have 1 or more terminal abdominal setae on each side, lack abdominal spiracles and any obvious abdominal segmentation, and the anal segment is never greatly prolonged. If all nymphs of this group are like that of *oryzomydis* Pratt and Lane, which is known from all three stages (Cook and Beer, 1959), and that of *nesoryzomydis* Ferris, described in the present paper, the first stage has 2 terminal abdominal setae on a side; the second stage has only 1 such seta on each side, while the third stage has paired setae plus a single one on each side.

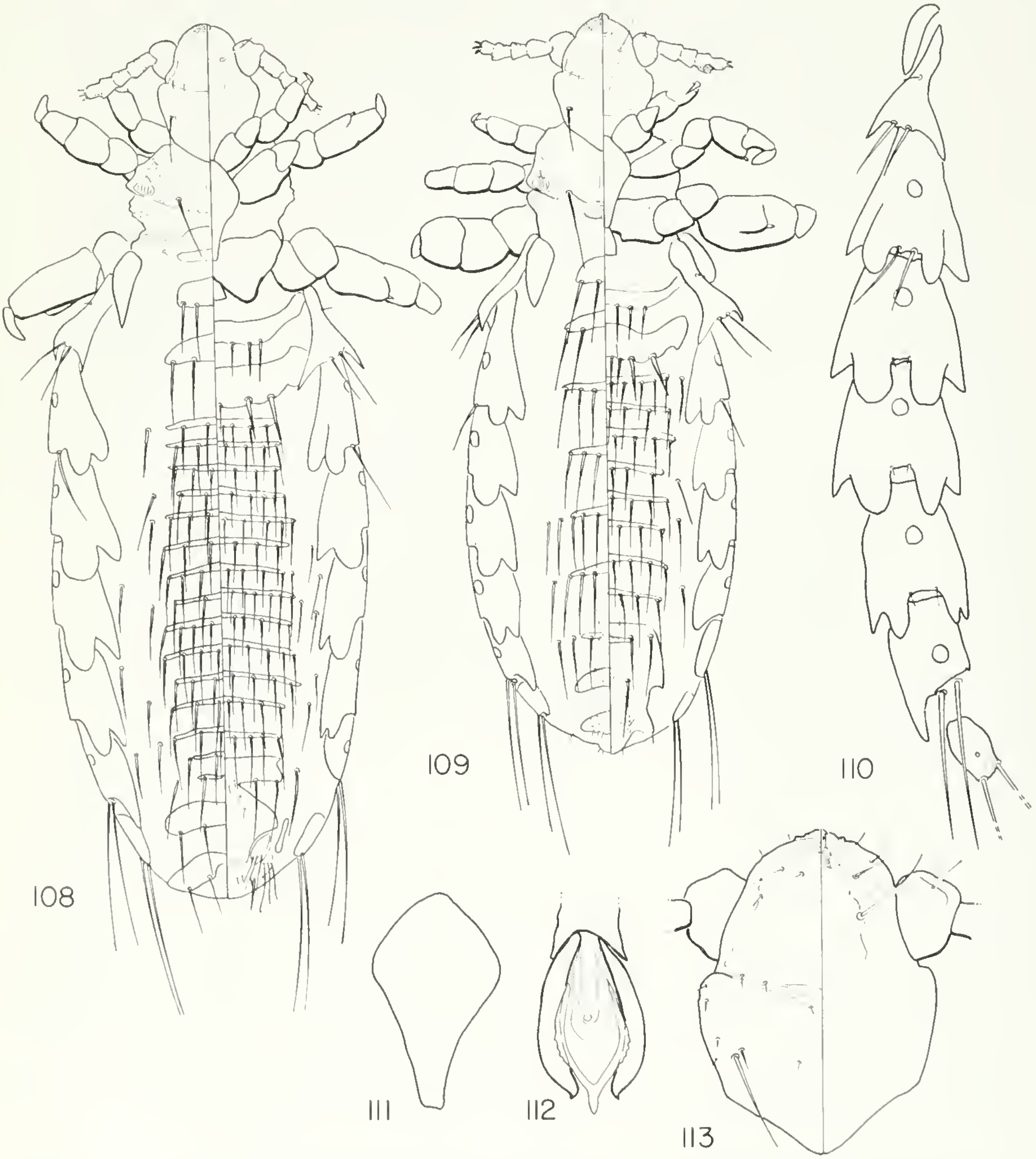


Fig 108-113. *Hoplopleura contigua*, new species, ex *Holochilus brasiliensis*. 108 allotype; 109, holotype; 110, paratergal plates, female paratype, ex (SVP 3029); 111 thoracic sternal plate, female paratype, ex (SVP 3041), 112 aedeagus, holotype; 113, head, male paratype ex (SVP 3041).

14. *Hoplopleura contigua*, new species*
(Fig. 108-113)

TYPE DATA: Male holotype, female allotype, 1 female and 1 male paratypes ex *Holochilus brasiliensis* (SVP 3040), Venezuela: Trujillo, 30 km NW Valera (near El Dividive), 90 m elev., 2-X-65, Peterson team collectors; 1 female and 1 male paratypes (SVP 3041), as above; 3 female and 2 male paratypes (SVP 32310), as above but Carabobo, Montalbán, Potserito, 1091 m elev., 7-XI-67, Tuttle team collectors; 2 female and 4 male paratypes (SVP 12372), as above but Bolivar, 146 km S, 7 km E Ciudad Bolivar (Hato San Jose), 297 m elev., 27-II-67, Peterson team collectors; 1 male paratype (SVP 12376), as above but 1-III-67.

Also Examined: 1 male ex *Sigmodon hispidus* (SVP 32319), Carabobo, Montalbán, Potserito, 1091 m elev., 7-XI-67, Tuttle team collectors; 1 female (broken) ex *Holochilus brasiliensis* (SVP 43555), Monagas, 55 km SE Maturin, Mata de Bejuco, 18 m elev., 4-VI-68, Tuttle team collectors.

DIAGNOSIS

A member of the *quadridentata* group. Separable from all known members of the group by a combination of having 2 long setae on both paratergites II and III; paratergite VII with a single, acute dorsoapical lobe; and plate VI with both apical lobes subdivided (Fig. 110).

LENGTHS

Male holotype, 1.3 mm; female allotype, 1.55; female paratypes, 1.25-1.7; male paratypes, 1.1-1.4 mm.

DESCRIPTION

MALE (Fig. 109): *Head* (Fig. 113). Rounded anteriorly, postantennal angles present, posterolateral margins slightly convex, convergent posteriorly; setation as in figure. *Thorax*. With posterior apex of sternal plate blunt or squared (Fig. 111, female); mesothoracic spiracle large, seta medial to spiracle long; dorsolateral portions of mesothorax rugose, slightly tuberculate. *Abdomen*. First tergum lacking plate and setae. One tergal and 2 sternal plates per typical segment; these narrow; apical setae of tergal plates flexible, elongate, slightly inflated medially; setae of venter similar; several setae off plates both dorsally and ventrally. Paratergal plates (Fig. 110, female) II-III with 2 long apical setae; plates IV-VI with apical lobes deeply subdivided, with 2 small, thin, but not minute, setae on each; plate VII with one acute apicodorsal lobe; plate VIII lacking lobes. *Aedeagus* (Fig. 112). Elongate; pseudopenis with arms flared and rounded medially; apex narrow, short, extending only slightly beyond parameres.

FEMALE (Fig. 108): As male except for usual sexual dimorphism. Three narrow tergal and sternal plates per typical abdominal segment, their apical setae as in male; several setae off plates dorsally and ventrally. First abdominal tergum with poorly sclerotized plate; 1 small seta, off plate, to each side. Genital plate of eighth segment with small rectangular plate to each side. Genital seta elongate, not particularly stout and not flattened.

15. *Hoplopleura nesoryzomydis* Ferris*
(Fig. 114-128)

Hoplopleura nesoryzomydis Ferris, 1921:90, Fig. 53*a*.

Hoplopleura quadridentata, Ferris, 1921:88 (*partim*, one of specimens—a female—recorded from *Oryzomys fulvescens*, USNM 58259, Mexico: Vera Cruz).

Hoplopleura nesoryzomydis, Hopkins, 1949:471, 472.—Ferris, 1951:127, 138.—Pratt and Lane, 1951:142, Fig. 6.—Wenzel and Johnson, 1966:275.

The female holotype, male allotype, 6 female and 2 male paratypes were from a museum skin of *Oryzomys narboroughi* (as *Nesoryzomys*), Galapagos Islands. Other paratypes were taken from a skin of *Oryzomys indefessus* (as *Nesoryzomys*), Galapagos Islands. Because of the large number of specimens obtained from these skins, accidental contamination probably was not involved. The Ferris Collection also includes a single female of *nesoryzomydis* from a skin of *Oryzomys fulvescens*, USNM 58259, Mexico: Vera Cruz, Orizaba. This specimen appears most like Venezuelan *nesoryzomydis*. In the same collection—all originally determined as *quadridentata* (Neumann) by Ferris—was included the type series of *H. similis* Kim. The record of two species of *Hoplopleura* from the same museum skin suggests that mechanical contamination may have taken place. Hopkins (1949) recorded *nesoryzomydis* from *Zygodontomys scorus*, *Callomys callosus* (as *Hesperomys venustus*), *Holochilus brasiliensis* (as *H. balnearum*, *H. sciureus*, and *H. volpinus*). *H. nesoryzomydis* is the typical anopluran parasite of *Zygodontomys brevicauda* in Trinidad, and in Panama it is common on *Z. brevicauda* (as *Z. cherriei*) and also occurs on *Oryzomys capito* (as *O. talamancae*).

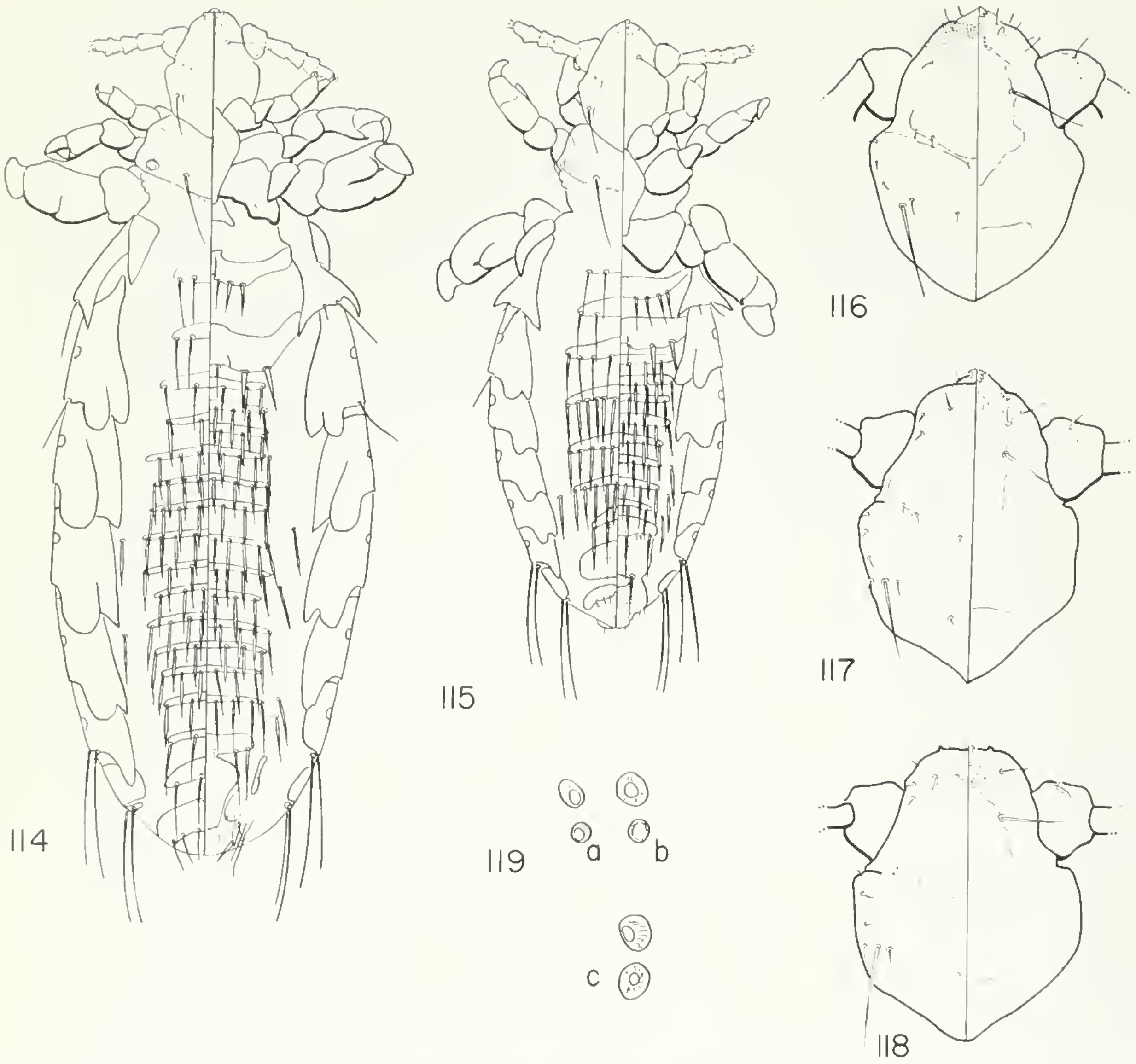


Fig. 114-119. *Hoplopleura nesoryzomydis* Ferris. 114, female, ex *Zygodontomys brevicauda* (SVP 3053); 115, male, same. Head, male: 116, allotype; 117, ex (SVP 3053); 118, Canal Zone, ex *Z. cherriei*, RML-43248; 119, spiracles of mesothorax (above) and paratergal plate III (below) (*a*, Canal Zone, ex *Z. cherriei*; *b*, Venezuela, ex *Z. brevicauda*; *c*, holotype).

Venezuelan Records

This species is the typical anopluran parasite of Venezuelan *Zygodontomys*. Over 450 females, males, and nymphs in 126 collections were taken from *Zygodontomys brevicauda* from various localities in T. F. Amazonas, Apure, Bolivar, Carabobo, Falcon, Lara, Miranda, Monagas, Sucre, Trujillo, Yaracuy, and Zulia. *H. nesoryzomydis* also occurred in 2 collections ex *Oryzomys fulvescens*, 2 ex *Oryzomys minutus*, and 6 ex *Heteromys anomalus*. The *Oryzomys* collections could represent normal occurrence, and comment on the *Heteromys* infestations will be found under *Fahrenholzia schwartzi*.

Diagnosis

A member of the *quadridentata* group. It may be separated in the adult from related species by the combination of having 1 apical lobe on paratergal plate VII; 1 long and 1 minute setae on plate III, and paratergal plate VI with 2 apical lobes, the dorsal one being subdivided more or less deeply, and the ventral one with only a small indentation at most.

Lengths

Female, 1.2-1.4 mm; male, 1.0-1.1 mm.

Redescription

Female (Fig. 114): *Head* (Fig. 116-118, male). Preantennal area projecting, rounded; posterolateral margins slightly convergent posteriorly except when head flattened during mounting; principal dorsal seta well developed, its accessory seta and other dorsal setae small but not minute. *Thorax.* Seta medial to mesothoracic spiracle very long. Sternal plate (Fig. 125-128) elongate, lateral angles rounded; apically truncate or slightly rounded. *Abdomen.* At times with indication of tergal plate on first segment. Usual arrangement of sternal plates and setae on segments 2-3; 3 tergal and 3 sternal plates on typical segments, their apical setae sharply pointed but only slightly sword shaped; some setae off plates dorsally and ventrally. Paratergal plates (Fig. 120) II-III with 1 long and 1 short to minute apical setae (short seta missing on II in holotype); IV-VI with 2 short to minute apical setae; VII-VIII with usual pair of long setae. Plates III-VI with dorsal and ventral apical lobes, those of plate III

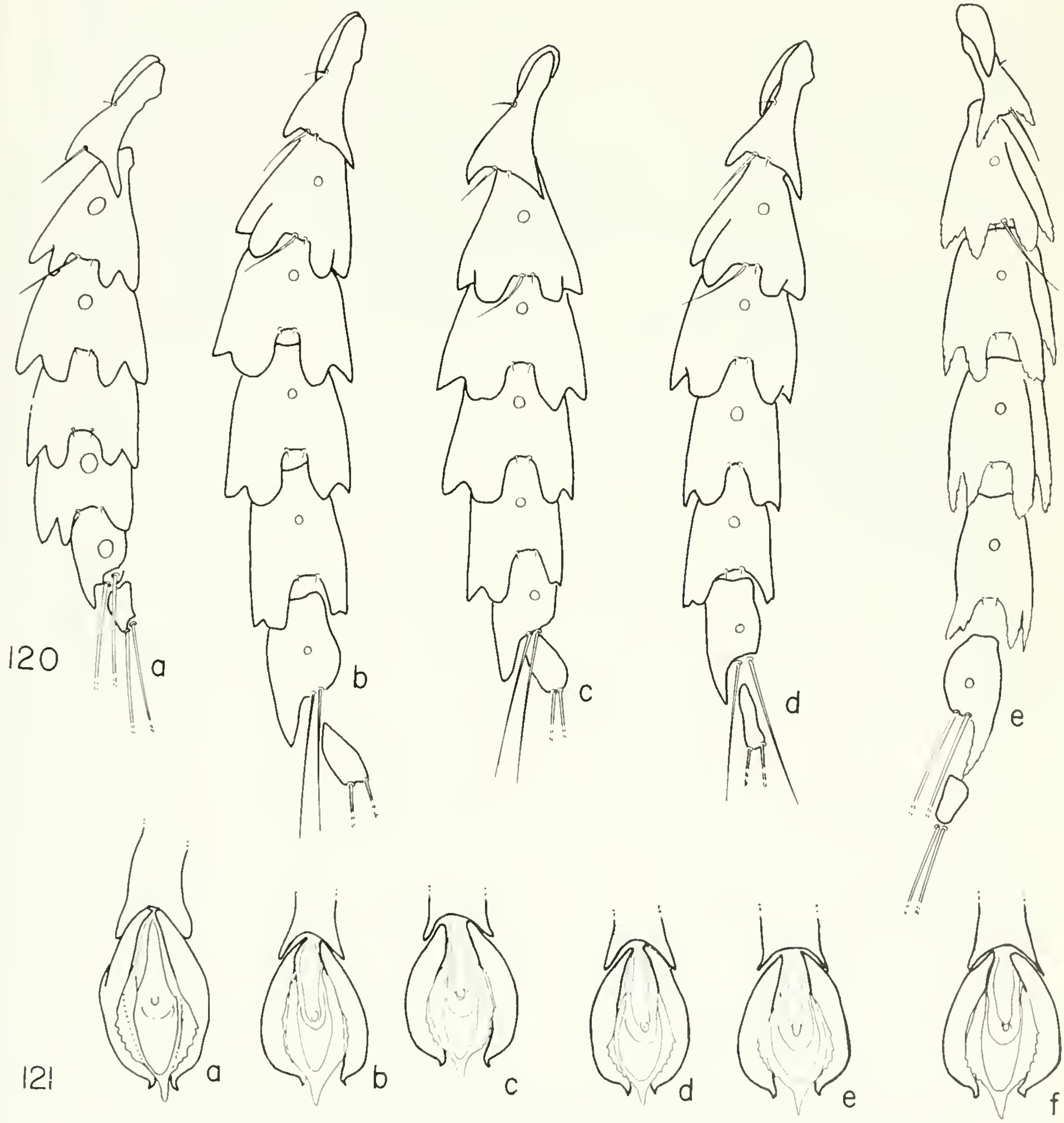
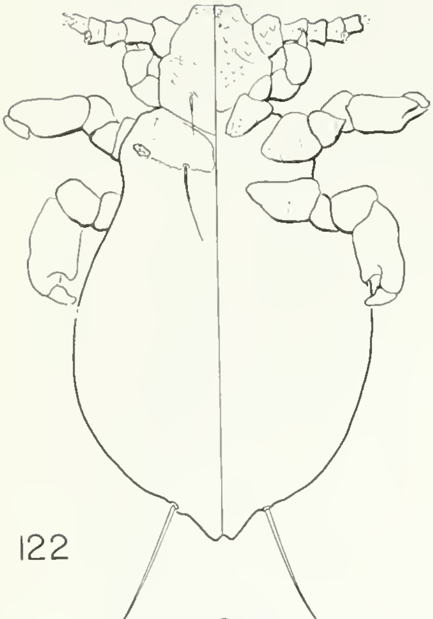
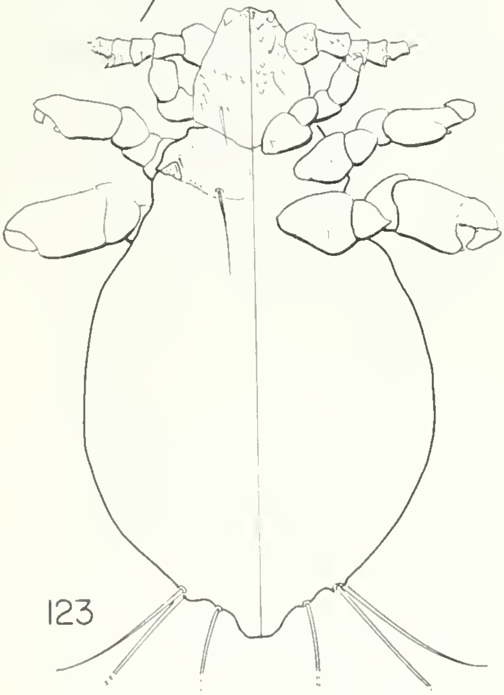


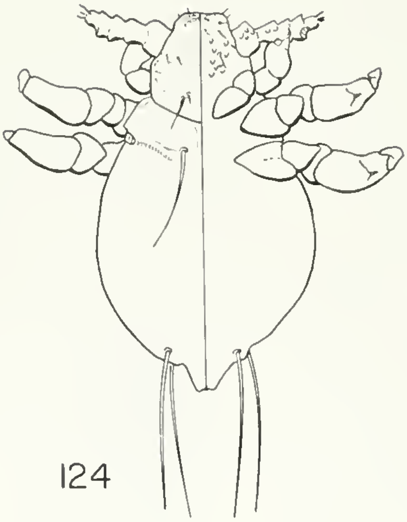
Fig. 120-121. *Hoplopleura nesoryzomydis* Ferris. 120 paratergal plates, female (*a*, holotype; *b*, Trinidad, ex *Zygodontomys brevicauda* TRVL-4577; *c*, Canal Zone, ex *Z. cherriei*, RML-44126; *d*, Venezuela, ex *Z. brevicauda* [SVP 3019], *e*, female, Menocucho, Peru, ex *Oryzomys xantheolus*, FCM-19431); 121, aedeagus (*a*, allotype; *b*, *c*, and *d*, Venezuela, ex *Z. brevicauda* [SVP 3053, SVP 10942, and SVP 25557]; *e*, Canal Zone, ex *Z. cherriei*, RML-43248; *f*, Trinidad, ex *Z. brevicauda*, TRVL-4577).



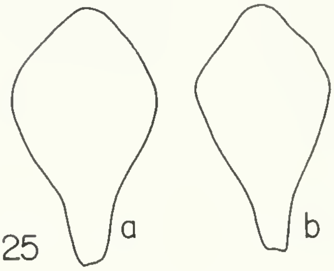
122



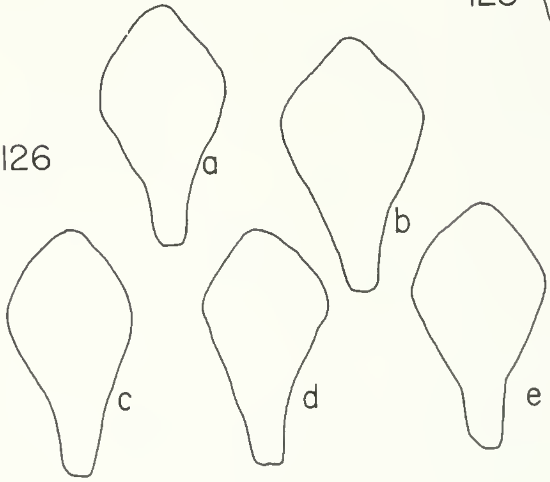
123



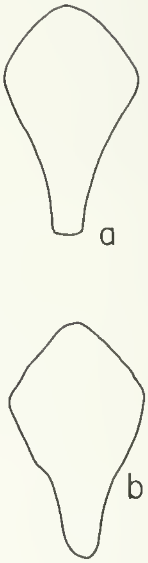
124



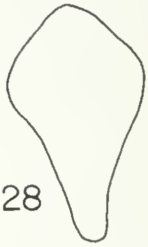
125



126



127



128

Fig. 122-128. *Hoplopleura nesoryzomydis* Ferris. 122, nymph, second instar, Trujillo, ex *Zygodontomys brevicauda* (SVP 3090); 123, same, third instar; 124, same, first instar, Miranda, ex (SVP 10949). Thoracic sternal plate: 125, Trinidad, ex *Z. brevicauda*, TRVL-4577 (*a*, female; *b*, male); 126, Venezuela, ex *Z. brevicauda* (*a*, male, Trujillo, ex V-3053, *b*, same, female; *c*, male, T. F. Amazonas, ex [SVP 25557]; *d*, male, Miranda, ex [SVP 10942]; *e*, female, same); 127 (*a*, female holotype; *b*, female, ex *Oryzomys xantheolus*, Peru, Menocucho, FCM-19131); 128, male, Canal Zone, ex *Z. cherriei*, RML-43248.

strongly subdivided; those of IV-VI succeedingly less so; plate VII with one dorsal lobe; plate VIII lacking apical lobes. Genital plate joined only medially; genital seta long, not flattened.

MALE (Fig. 115): As female except in usual sexually dimorphic features. Abdominal plates as usual: 2 sternal and 1 tergal plates per typical segment, their apical setae long, slender, not sword shaped. *Aedeagus* (Fig. 121). With parameres expanded posteriorly, pseudopenis apically acute; lateral arms serrate, not strongly angled medially.

NYMPH (Fig. 122-124): *Third stage* (Fig. 123). With head and thorax not markedly rugose or scaly dorsally; principal dorsal head seta not especially stout; lateral and median dorsal head setae neither minute nor thornlike. One pair and a single terminal abdominal setae on each side. *Second stage* (Fig. 122). Like third except only 1 terminal abdominal seta per side. *First stage* (Fig. 124). With 1 pair of terminal abdominal setae on each side, very long dorsal mesothoracic seta.

DISCUSSION

Whether the observed variation depends on geographic or host factors, or a combination of both, remains to be seen. Head shape is similar in all specimens, the slight differences seen probably are due to position and flattening during mounting (compare Fig. 116-118). Variation of the shape of the thoracic sternal plate in Venezuelan specimens appears to equal that seen in specimens from all the other localities (compare Fig. 125-128). The type series, ex *Oryzomys narboroughi*, is of like size and is otherwise similar to the Venezuelan forms except that the abdominal spiracles are larger (compare Fig. 119*a-c*); the abdominal setae are more sword shaped in the type series, and the apicodorsal lobe of paratergal plate VII is not as long as in the Venezuelan specimens. *H. nesoryzomydis* from Panama is similar to that from Venezuela. *H. nesoryzomydis* from Trinidad has the abdominal setae as sword shaped as in the type series, but the abdominal spiracles are small. The male genitalia of all are similar except the allotype has the parameres evenly rounded laterally rather than expanded apically (compare Fig. 121*a-f*).

The single female Ferris recorded from *Oryzomys xantheolus*, FCM 19431, Peru: Menocucho, has small abdominal spiracles; the thoracic sternal plate (Fig. 127*b*) is narrower than in typical *nesoryzomydis*, and the apical lobes of the paratergal plates are narrower, longer, and scaly (Fig. 120*e*). There also are more setae off the abdominal plates. The abdominal setae are like the types of *nesoryzomydis* in their being shorter and more sword shaped than in specimens from other hosts and localities. I have seen a second female, ex *Oryzomys xantheolus*, Peru: Piura, La Arena (Field Museum of Natural History), that has paratergal plates and other characters as the Peruvian female from the Ferris Collection.

The male recorded by Ferris (1921) ex *Oryzomys angouya*, FCM 18167, Paraguay: Sapucay, may be a different species. It has the apical setae of paratergal plates II-III short, barely exceeding the apices of the lobes, paratergal plate VI has a single dorsal lobe, and plate VII lacks apical lobes. The male genitalia are similar but somewhat longer than in typical *nesoryzomydis*.

16. *Hoplopleura oryzomydis* Pratt and Lane*

(Fig. 129-137)

Hoplopleura oryzomydis Pratt and Lane, 1951: 141, Fig. 1-3.—Cook and Beer, 1959:409, Fig. 11, 20, 26.

The female holotype and male allotype were from *Oryzomys palustris palustris*, USA: Georgia. Many paratypes were taken from the same host and locality as well as from *O. p. palustris* and *O. p. coloratus* in Delaware, South Carolina, and Florida. It has also been recorded from *O. palustris*, USA: Louisiana. I have seen paratypes from Florida.

VENEZUELAN RECORDS

Two females, 4 males, and 1 nymph, apparently of this species, were collected from *Nectomys alfari* (SVP 22790), Zulia, 3 km S, 19 km W Machiques (Novito).

DIAGNOSIS

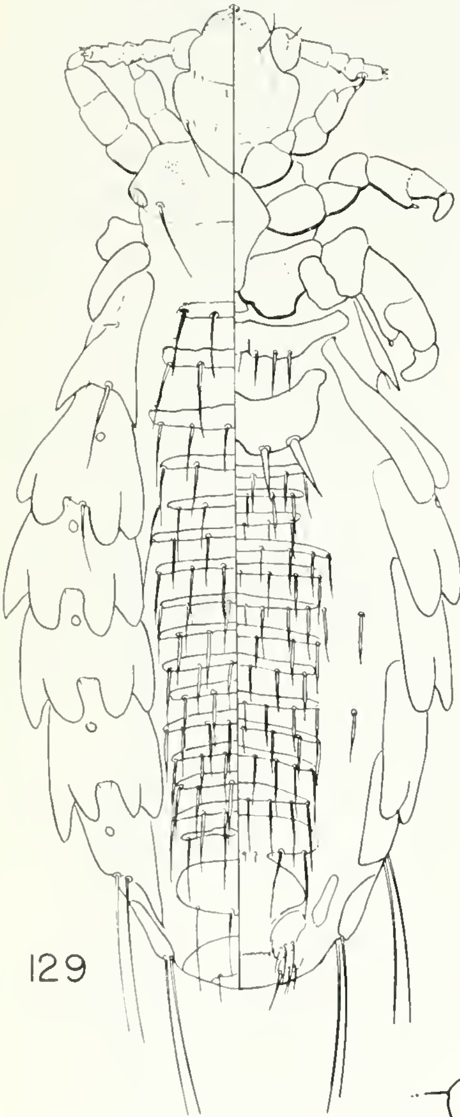
A member of the *quadridentata* group. *H. oryzomydis* can be separated from other species of this group by a combination of its having only one apical lobe on paratergal plate VII; both apical lobes of plate VI equally and deeply subdivided; and with 1 long and 1 minute apical setae on plate III (Fig. 131).

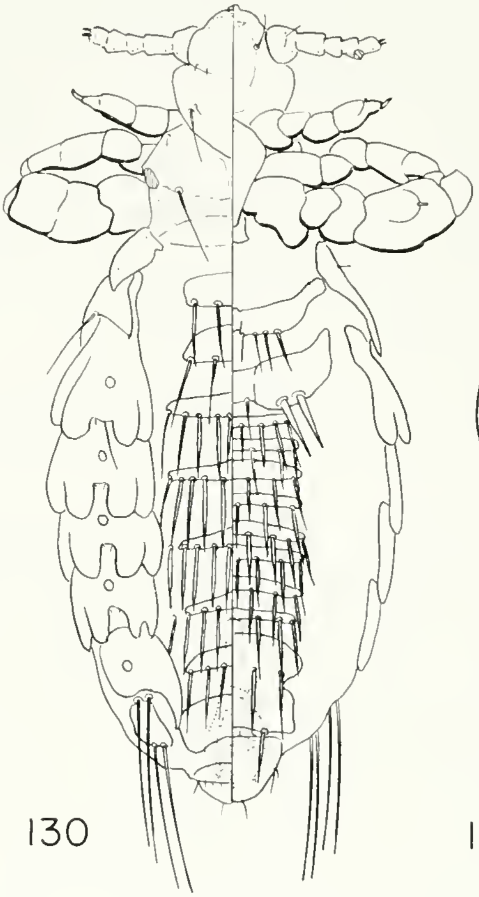
LENGTHS

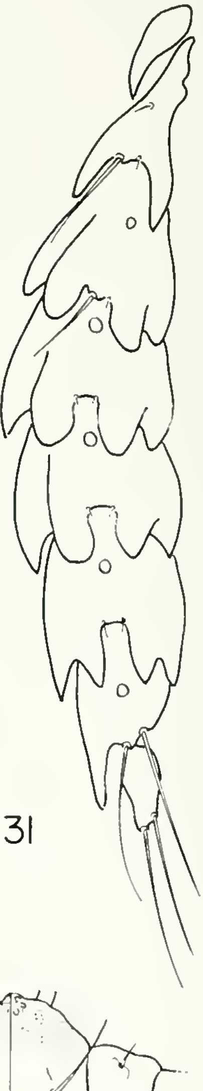
Female, 1.3-1.35 mm (USA paratypes, 1.3-1.45 mm); male, 1.0-1.05 mm (USA paratypes, 1.2 mm).

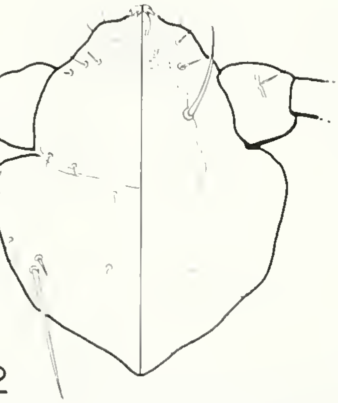
DISCUSSION

The differences between North American *oryzomydis* and the Venezuelan specimens are so slight that there is no salient reason for assuming on morphological grounds that the South American form represents a different species. Adults from the Venezuelan collection are similar to paratypes from Florida, except that the Venezuelan females have 3 or 4 setae on the tergal plate of abdominal segment 8 rather than 2 (Fig. 129) and there are fewer setae ventrally off the abdominal plates. Heads of the two forms are similar (Fig. 132, 133). The shape of the aedeagus of Venezuelan males approximates that of the male illustrated by Pratt and Lane, but in the paratypes I examined the parameres were less convex (Fig. 136*a*). These slight differences probably depend somewhat on positioning of the parts. The nymphal third instar (Fig. 134) has 1 pair plus 1 long seta per side instead of 1 pair of long setae and 1 pair consisting of 1 long and 1 small setae—as shown by


129


130


131


132

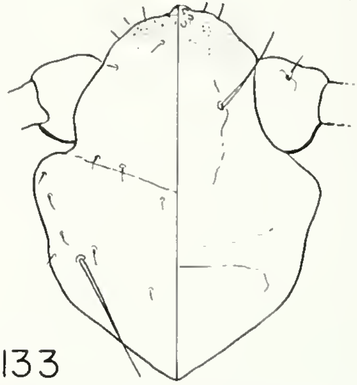

133

Fig. 129-133. *Hoplopleura oryzomydis* Pratt and Lane. 129, female, ex *Nectomys alfari* (SVP 22790); 130, male, same; 131, paratergal plates, female, same; 132, head, male, same; 133, head, male, paratype, Florida.

Cook and Beer (1959), but not described by Pratt and Lane in their original description of *oryzomydis*. Also, in the Venezuelan nymphs, the dorsolateral head setae are fine and very small; whereas in Cook's and Beer's Fig. 26, these setae are drawn as being relatively well developed.

17. *Hoplopleura multilobata* Werneck, *sensu lato*[*]

(Fig. 138-145)

Hoplopleura multilobata Werneck, 1954:109, Fig. 1, 3-5.

The unique female holotype was recorded as being from *Proechimys iheringi*, Brazil: State of Espérito Santo.

VENEZUELAN RECORDS

The specimens, provisionally assigned here to *H. multilobata* Werneck, are the first mentioned since the original description. There were 50 collections, containing 97 females, 40 males, and 16 nymphs from *Oryzomys albigularis*, from various localities in Dto. Federal, Trujillo, Merida, and Tachira; 4 collections of 5 females 3 males, and 3 nymphs ex *Oryzomys minutus* (SVP 3930, 4557, 3972, 4221), Merida; 1 nymph from *Oryzomys concolor* (SVP 716), Dto. Federal; and 4 collections of 6 females and 1 male ex *Heteromys anomalus* (SVP 1011, 1036, 1040 14621), Dto. Federal and Sucre.

I have also examined 3 females, in 2 collections, from *O. albigularis*, Colombia: Department of Cauca, Munchique (no. 1806) and Department of Valle (no. 1385), H. Trapido collector, Rockefeller Foundation.

DIAGNOSIS

H. multilobata is easily distinguished from other known South American species of *Hoplopleura* by the greatly enlarged first antennal segment (Fig. 145). This species is most closely related to the *quadridentata* group, departing from this group by having only 1 minute seta on paratergal plate III rather than at least 1 long seta in this position. The male genitalia are similar but more compressed and elongate (Fig. 142). Setation of the terminal segments of the nymphal abdomen agrees with that of the *quadridentata* group.

LENGTHS

Female, 1.3-1.4 mm; male, 1.0 mm.

REDESCRIPTION

FEMALE (Fig. 140): *Head* (Fig. 145, male). Flattened apically; posterolateral margins parallel, straight; principal dorsal seta long, stout, its accessory seta short but stout; other dorsal seta minute. First antennal segment much enlarged, broader than long. *Thorax*. Mesothoracic seta long. Sternal plate (Fig. 144) prominent, very well sclerotized, apically truncate, more than one and one-half times as long as broad, posterolateral margins somewhat concave. *Abdomen*. Tergal and sternal plates well developed, enlarged setae on first sternal plate of segment 3 not much larger than other setae on this plate; 3 tergal and 3 sternal plates per typical segment, their apical setae elongate, thin, not sword shaped; no setae off plates. Paratergal plates (Fig. 143) III-VII with rounded dorsal and ventral apical lobes, these secondarily divided, usually 2 or more of these plates have the secondary lobes further divided. Plate II with 2 long apical setae; plate III with 1 minute seta; plates IV-VI with 1 minute marginal seta and 1 minute seta on the dorsal face of the plate; plates VII-VIII with usual pair of long apical setae. Genital seta medium sized, not very thickened.

MALE (Fig. 141): As female except in usual sexually dimorphic characters. *Abdomen* with 2 sternal and 1 tergal plates per typical segment; all these well developed; apical setae of tergal plates elongate and inflated medially; setae of sternal plates slightly sword shaped; no setae off plates. *Aedeagus* (Fig. 142). With shape of parameres depending on position; parameres and pseudopenis elongate, apically acute; pseudopenis flared medially, margins serrate distad to flare.

NYMPH (Fig. 138, 139): All instars with enlarged first antennal segment; antennal segments 3-5 with strong posteriorly directed setae dorsally; minute dorsolateral head setae; principal dorsal head seta stout, especially in third instar, this seta accompanied by small, stout accessory seta. Second and third instars similar except that third instar (Fig. 139) with 3 terminal abdominal setae per side, and second instar with 1 terminal seta per side. First instar (Fig. 138) with 2 terminal abdominal setae on each side; dorsal thoracic seta very long.

DISCUSSION

Considering the disparity in hosts and geographical distribution (*Oryzomys albigularis*, a myomorph, is primarily Andean and does not extend to the Brazilian coast where holotypic *multilobata* supposedly was taken from *Proechimys*, a hystricomorph), I have strong reservations concerning identity of holotypic *multilobata* with the Venezuelan specimens. However, in the absence of obvious morphological differences, without examination of the holotype of *multilobata*, and considering the possibility of erroneous host association of that holotype, it is impossible to assume that the

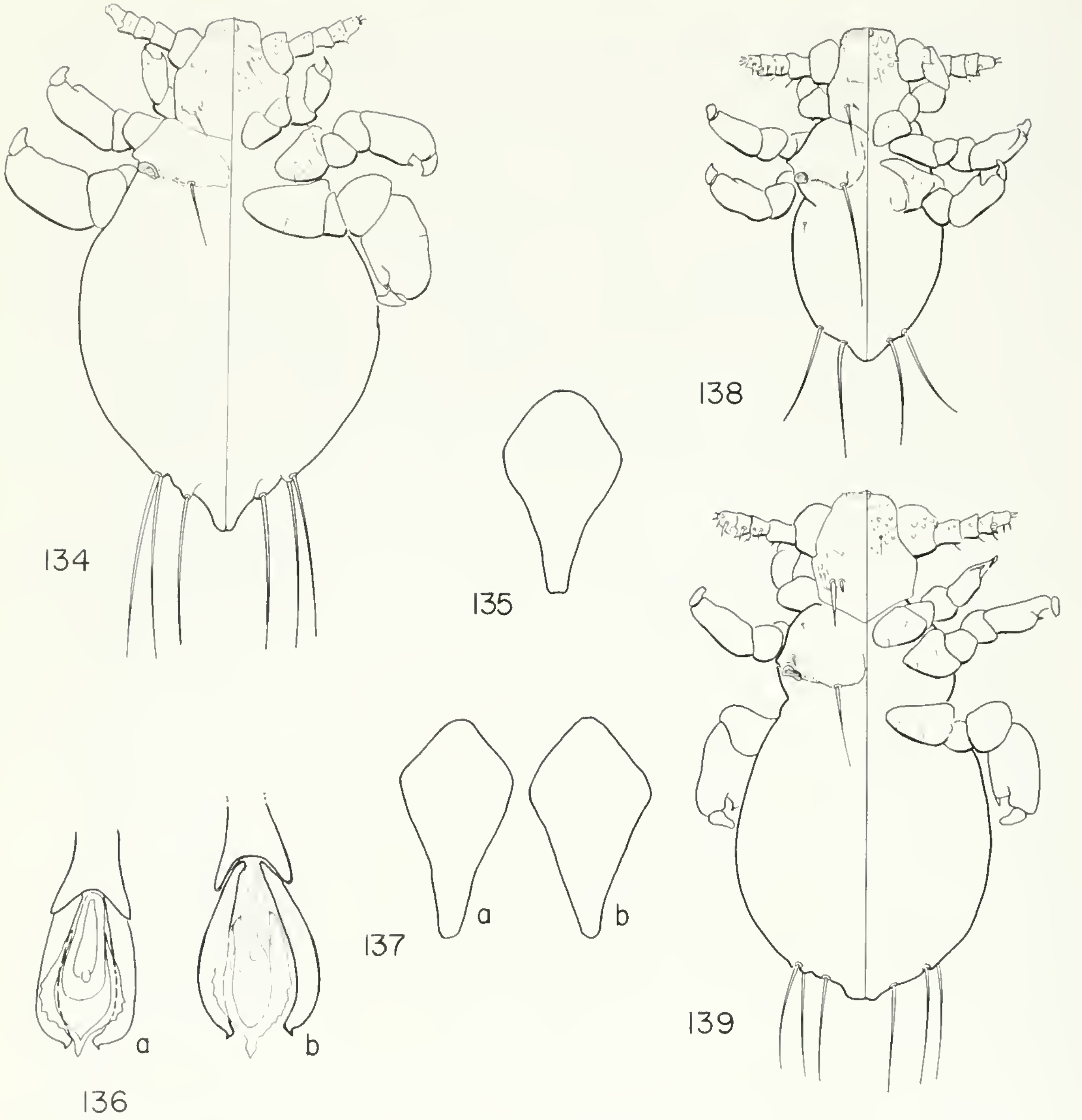


Fig. 134-139. *Hoplopleura quadridentata* group. 134, *H. oryzomydis* Pratt and Lane, nymph, third instar, ex *Nectomys alfari* (SVP 22790); 135, same, thoracic sternal plate, male, ex (SVP 22790); 136, same aedeagus (*a*, paratype, Florida; *b*, Venezuela, ex [SVP 22790]); 137, same, thoracic sternal plate, paratypes, Florida (*a*, male; *b*, female); 138, *H. multilobata* Werneck nymph, first instar, Dto. Federal, ex *Oryzomys albigularis* (SVP 3713); 139, same, third instar.

Venezuelan specimens belong to a different species. The present series agrees quite well with the original description of *multilobata*, except the apical lobes of the paratergal plates are not so strongly subdivided, usually having only 2 or 3 marked secondary lobules (Fig. 143) rather than the 6-8 occurring in the type female. Setation of the paratergal plates may be as in the holotype. Although Werneck pictured only a single minute apical seta on plates IV-VI, the second apical seta of these plates is very small and, being removed from the margin, could easily be overlooked. The thoracic sternal plate is as in holotypic *multilobata*.

18. *Hoplopleura scapteromydis* Ronderos

(Fig. 146-152, 156)

Hoplopleura scapteromydis Ronderos, 1965:46, Fig. 1-3.

The unique female holotype was from *Scapteromys tumidus* (as *S. tumidus aquaticus*). Argentina: Province of Buenos Aires, Castelli. Since the host of *scapteromydis* does not occur in Venezuela, it would not be expected to occur there. However, the male and nymph have not been described, and the relationship of this southern species to the *quadridentata* group adds to our understanding of the supraspecific relationships in the genus *Hoplopleura*.

New Records

There were 86 females, 54 males, and 21 nymphs of the second and third instar in more than 25 collections ex *Scapteromys* sp., Uruguay: Departments of Soriano, Trienta y Tres, and Maldonado (American Museum of Natural History).

Diagnosis

Close to *H. fonsecai* Werneck and *H. oxymycteri* Ferris. Separable from all other South American *Hoplopleura* species by the combination of having the thoracic sternal plate prolonged posteriorly and with a blunt apex; apical setae of paratergal plates II-III normal, not thickened or apically hooked; plate III with the apical lobes broad and apically angled; plates

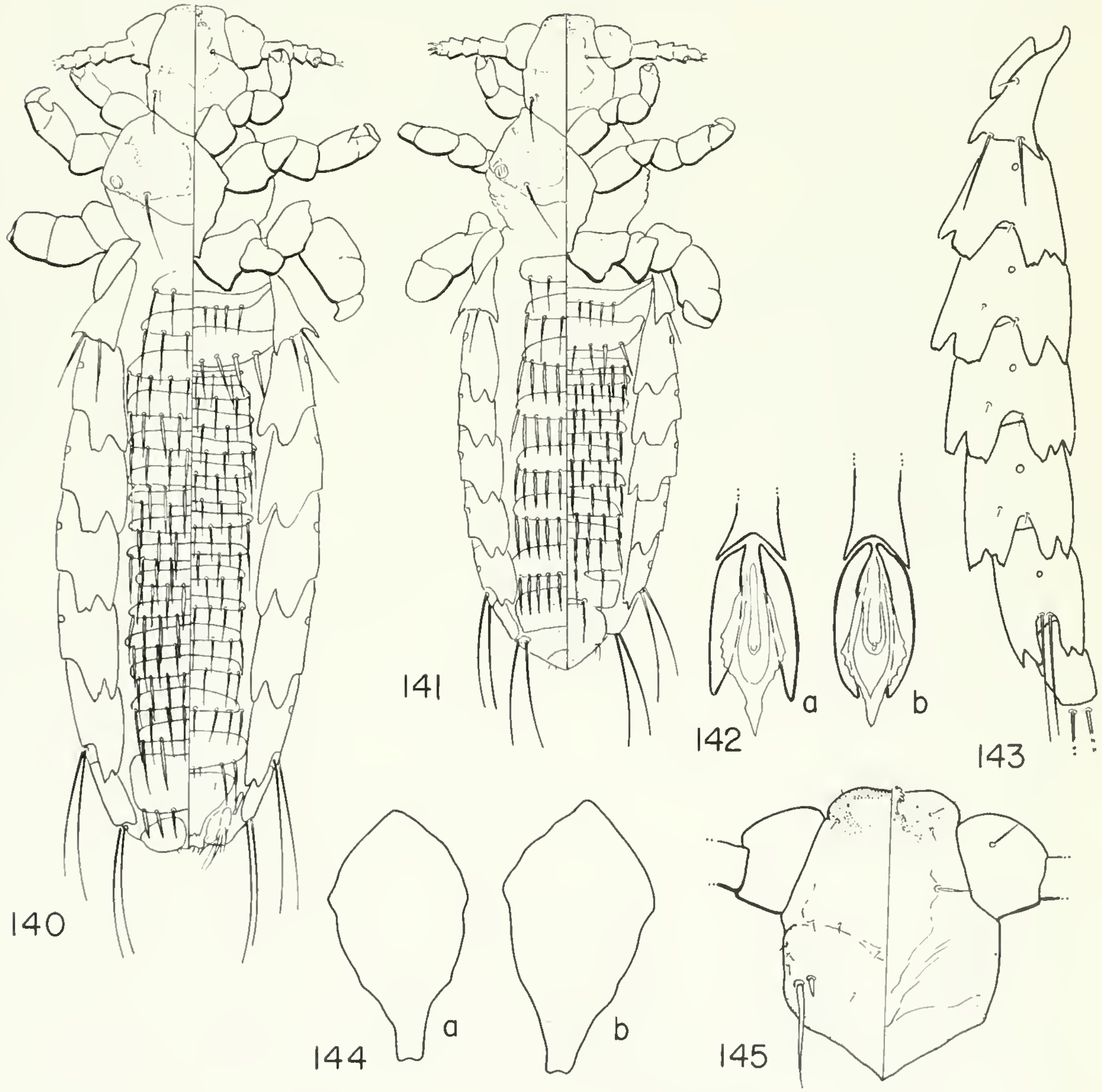


Fig. 140-145. *Hoplopleura multilobata* Werneck, ex *Oryzomys albigularis*. 140, female, Trujillo, ex (SVP 3896); 141, male, same; 142, aedeagus (*a*, Merida, ex [SVP 4566]; *b*, Trujillo, ex [SVP 3896]); 143, paratergal plates, female, Trujillo, ex (SVP 3896); 144, thoracic sternal plate, ex (SVP 3896) (*a*, male; *b*, female); 145, head, male, ex (SVP 3896).

IV-VI with acute apical angles, the dorsal one subdivided; and lacking apical lobes on plates VII-VIII (Fig. 156).

Lengths

Female, 1.2-1.45 mm; male, 0.95-1.1 mm.

Redescription

Male (Fig. 147): *Head* (Fig. 150). Anteriorly flattened; one of anteroventral setae longer than usual in genus, and usually projecting at right angles from head; dorsolateral setae minute; principal dorsal seta stout, its accessory seta minute; postantennal angles pronounced; posterolateral head margins slightly convex and posteriorly convergent. *Thorax*. With long, dorsal mesothoracic seta. Sternal plate (Fig. 152, female) subrounded anteriorly, posteriorly prolonged, apex blunt, even slightly concave. *Abdomen*. One tergal and 2 sternal plates per typical segment, these thin, sometimes incomplete dorsally; 1 lateral seta well removed from each tergal plate on segments 6-7 and often 4-5; ventrally 1 lateral seta per segment off plates. Abdominal setae elongate, little or not at all inflated, not sword shaped. Sternal plates of segments 2-3 as usual in genus. Paratergal plates (Fig. 156, female) with II having 2 setae longer than acute apical

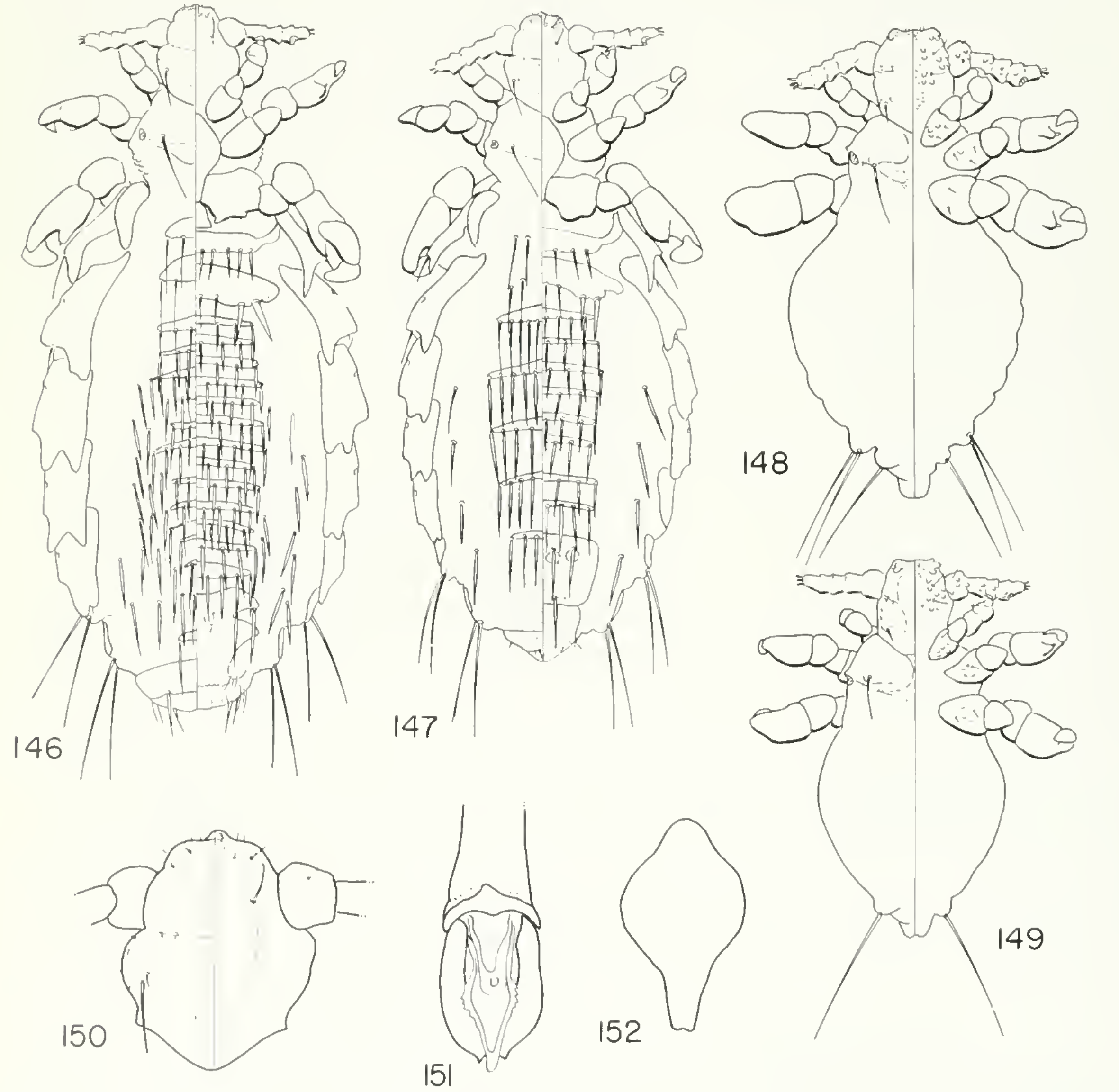


Fig. 146-152. *Hoplopleura scapteromydis* Rondetos, Uruguay, ex *Scapteromys* species. 146, female, Dept. Maldonado, AMNH-206252 -56, -57; 147, male, same; 148, nymph, third instar, same; 149, nymph, second instar, same; 150, head male, same; 151, aedeagus, same; 152, thoracic sternal plate female, Dept. Soriano, ex AMNH-206298-308

lobes; plate III with 1 apical seta exceeding acute apical lobes, other seta small; plates IV-V with dorsoapical lobe secondarily subdivided into 2 acute points, ventral lobe either with small indentation or merely undulate apically; plate VI with dorsoapical lobe sometimes subdivided, apical lobe poorly developed, subrounded to acute. Setae on plates IV-VI variously developed, always small to minute, sometimes apparently lacking. Plates VII-VIII lacking apical lobes, with usual 2 long apical setae. *Aedeagus* (Fig. 151). Has pseudopenis somewhat flared medially, slightly serrate laterally, apex short, extending only slightly beyond parameres; parameres acute apically.

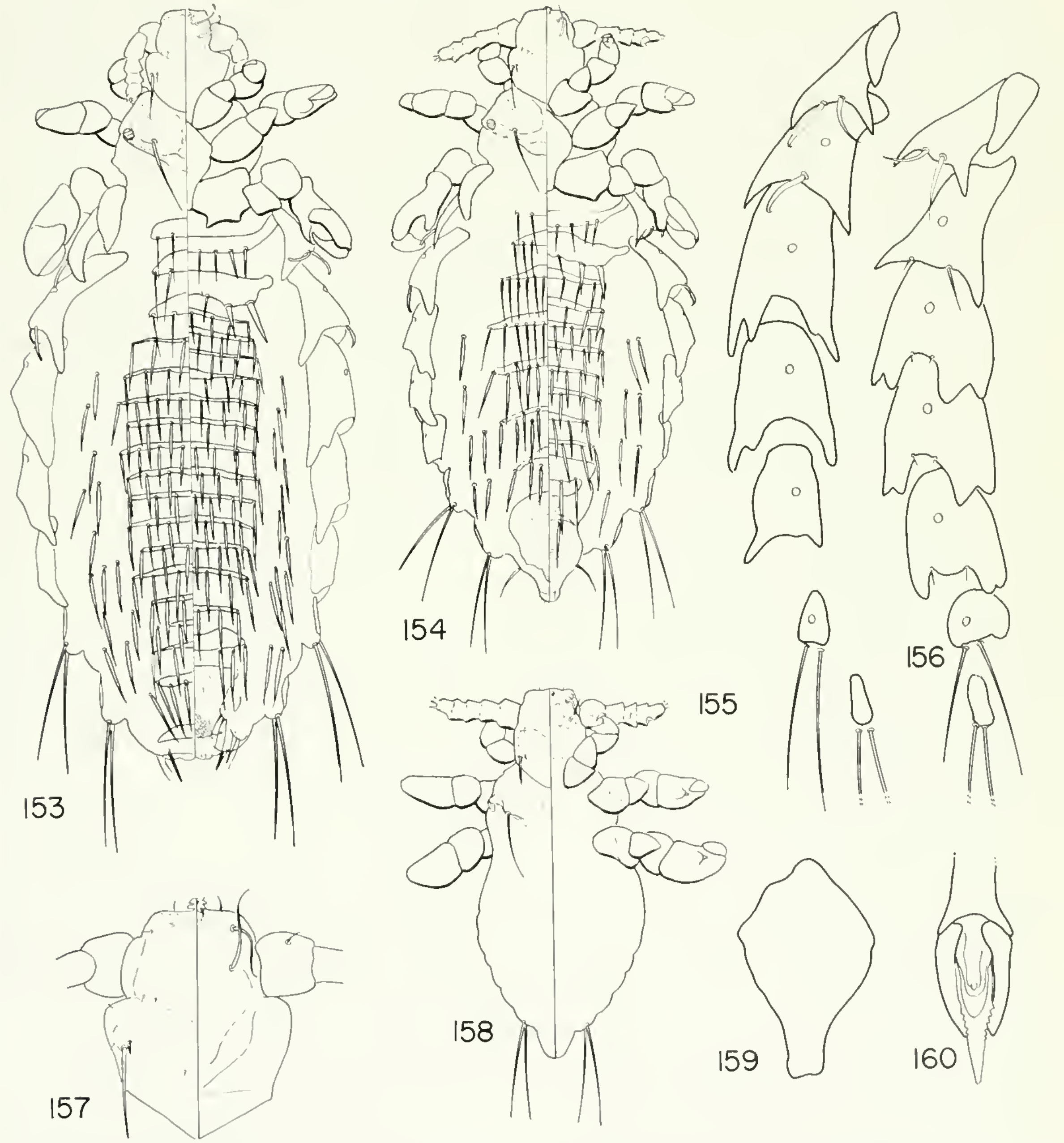


Fig. 153-160. *Hoplopleura* species. 153. *H. fonsecai* Werneck, female, Uruguay, ex *Oxymycterus rufus nasutus*, AMNH-206196; 154, same, male, ex *O. r. nasutus*, AMNH-206193. 155, same, paratergal plates, female, ex *O. r. nasutus*, AMNH-206196; 156. *H. scapteromydis* Ronderos, paratergal plates, female, Uruguay, ex *Scapteromys* species, AMNH-206298-308. 157. *H. fonsecai*, head, male, ex *O. r. nasutus*, AMNH-20693; 158. same, nymph, second instar, ex *O. r. nasutus*, AMNH-206195; 159 same, thoracic sternal plate, female, AMNH-206196; 160, same, aedeagus, AMNH-206193.

FEMALE (Fig. 146): As male except for sexually dimorphic characters. Tergal plates of abdomen often strongly reduced and incomplete; lateral setae off abdominal plates both ventrally and dorsally. Paratergal plates (Fig. 156) with apical lobes of IV-V more strongly subdivided than in male; plate VI with dorsal lobe subdivided, ventral lobe undivided, acute. Genital seta elongate, not flattened.

NYMPH (Fig. 148, 149): Ventral head tubercles rounded, principal dorsal head seta short, stout; other dorsal setae of head minute. One anteroventral head seta on each side elongate, as long as principal ventral head seta. *Third instar* (Fig. 148). With 3 terminal abdominal setae per side arranged as a pair and a single; indication of segmentation of abdomen; anal segment slightly prolonged. *Second instar* (Fig. 149). As third except with a single terminal abdominal seta on each side. *First instar.* Unknown.

DISCUSSION

A definite relationship with the *quadridentata* group is shown by the shape of the thoracic sternal plate; lack of large setae on the plate of the first abdominal tergum; the tendency toward deep subdivision of the apical lobes of the paratergal plates, and their setation; and the setation of the terminal abdominal segments of the nymph. However, its closest relatives appear to be *H. fonsecai* Werneck, also discussed in this paper, and *H. oxymycteri* Ferris, from Peruvian *Oxymycterus paramensis.* These 3 species occupy a somewhat isolated and intermediate position between *quadridentata*-group species and forms related to *H. alata* Ferris.

19. *Hoplopleura fonsecai* Werneck

(Fig. 153-155, 157-160)

Hoplopleura fonsecai Werneck, 1934:412, Fig. 7-12.–Hopkins, 1949:471. – Ferris, 1951:128, 136.–Ronderos and Capri, 1965:38. – Ronderos, 1965:48, 50. – Ronderos and Capri, 1966:97.

The female holotype, male allotype, 4 female and 1 male paratypes, and an unstated number of nymphs were taken from the cricetine *Oxymycterus judex*, Brazil: State of Santa Catarina, Humboldt. Ronderos and Capri (1965) recorded 4 females and 4 males ex *Oxymycterus rufus platensis* (as *O. rutilans platensis*), Argentina: Province of Buenos Aires. I have studied 3 collections of this species, all ex *Oxymycterus rufus nasutus*, Uruguay: Department of Rocha, 22 km SE Lascano: 1 female and 2 males, AMNH-106193; 1 female and 4 nymphs, AMNH-206195; 8 females and 5 males, AMNH-206196 (American Museum of Natural History). As with the related species, *scapteromydis* Ronderos, *fonsecai* is not known to occur in Venezuela and is included for comparative purposes.

DIAGNOSIS

Separable from all known South American species of *Hoplopleura* by having the apical setae of paratergal plates II-III thickened, the single apical seta of plate III, and 1 of the 2 setae on II with an apical hook (Fig. 155).

LENGTHS

Female, 1.4-1.55 mm; male, 1.0-1.15 mm.

REDESCRIPTION

MALE (Fig. 154): *Head* (Fig. 157). Truncate anteriorly, one anteroventral seta bent posteriad and as long as principal ventral seta. Postantennal angles rounded; principal dorsal seta stout, set at about middle of slightly convex posterolateral margin, its accessory seta thornlike; other dorsal setae thin, very small. *Thorax.* Seta medial to mesothoracic spiracle long. Sternal plate (Fig. 159, female) angled anteriorly and laterally, posterolateral margins concave, narrowing to blunt posterior apex. *Abdomen.* Lacking tergal plate or setae on segment 1; arrangement of remaining plates as usual: 1 dorsal and 2 ventral plates per typical segment, these narrow, their posteroapical rows of setae numerous; setae off plates dorsally and ventrally on segments 4-7; all setae long, thin to slightly inflated medially. Sternal plates and setae of segments 2-3 as usual in genus. Paratergal plate (Fig. 155, female) II with acute apical angles, 2 thickened apical setae, one often with apex hooked; III with both apical angles acute, bearing 1 thickened, apically hooked seta; plates IV-VI with acute apical lobes, dorsoapical lobes subdivided on IV-V; IV-VI lacking apical setae; plates VII-VIII lacking apical lobes, with usual pairs of long setae. *Aedeagus* (Fig. 160). Narrow, parameres only slightly convex laterally; pseudopenis elongate-triangular, mediolaterally serrate; apex acute.

FEMALE (Fig. 153): As male except for usual sexually dimorphic characters. Abdomen with 3 narrow dorsal and ventral plates and rows of long, slightly inflated setae per typical segment; setae off plates dorsally and ventrally particularly numerous on segments 5-7. Genital plate divided, with strongly reticulate pattern medially near posterior margin. Genital seta stout, medium sized, not bladelike.

NYMPH (Fig. 158): First and second instars represented, first instar not in condition to illustrate. Second instar with head truncate anteriorly, ventrally tuberculate; one of anteroventral setae as long as principal ventral seta, curved posteriad as in adult. Principal dorsal head seta stout, its accessory seta and other dorsal setae minute. Thoracic dorsal seta long. Anal lobe somewhat extended. One pair of subterminal abdominal setae on each side. Setation of first instar as in second; third leg not noticeably larger than second.

DISCUSSION

The elongate anteroventral head setae of the adult and nymph of *fonsecai* suggest an exaggerated example of the condition in nymphal *scapteromydis*, as does the general configuration of the paratergal plates. The thoracic sternal plate of *fonsecai* is like that found in the *quadridentata* group. The nymph is like the *alata*-related species in that the dorsal thoracic seta of the first instar is not greatly prolonged. As mentioned in the discussion of *scapteromydis*, *H. fonsecai*, *H. scapteromydis*, and *H. oxymycteri* are somewhat isolated, but the morphology of the adults and known nymphs suggests a relationship to both the *quadridentata* and the *alata* groups.

20. *Hoplopleura alata* Ferris

(Fig. 163-165, 175)

Hoplopleura alata Ferris, 1921:127, Fig. 84, 85.

Pterophthirus alata Ewing, 1923:147.—Werneck, 1942:317.—Hopkins, 1949:489. — Guimarães, 1950:83.—Ferris, 1951:144.

The female holotype and an unstated number of female and male paratypes were taken from the skin of *Microcavia australis* (as *Kerodon*), USNM 84175, Argentina: Patagonia, Upper Rió Chico. Werneck (1942) recorded numerous examples from *M. australis* (as *Caviella*), Argentina: Provinces of Jujuy and Catamarca. I have examined a pair of paratypes from the collections of the United States National Museum. Figures of the paratergal plates (Fig. 163), thoracic sternal plate (Fig. 164), aedeagus (Fig. 165), and the sternal plate of abdominal segment 2 (Fig. 175) have been included for comparative purposes.

DISCUSSION

H. alata may serve as typical of the group of Central and South American species of *Hoplopleura* that Ewing (1923) placed in *Pterophthirus*, with *alata* as type of that genus. In order to assess properly the affinities of the Venezuelan representative of this group, all known *alata*-group species are discussed herein. It appears that the most aberrant member of the *alata* group is the new species from Venezuela that is described in this paper, closely followed by *audax* Ferris, and then *alata*, *wernecki* (Guimarães) and *imitans* (Werneck), in descending order. The two very aberrant forms, the new species and *audax*, generally follow a northern distribution, occurring on the echimyids *Proechimys* and *Hoplomys* while *alata*, also very aberrant, and *imitans*, which is much less so, are more southern, occurring on caviids. The hosts are all hystricomorphs but belong in different superfamilies. The host and geographical distribution of *wernecki* is incompletely known, except that it is a common parasite of *Proechimys iheringi*. If *wernecki* occurs only on species of *Proechimys*, it would not extend south into areas where members of that rodent genus do not occur.

On the one hand, *fonsecai* Werneck, *scapteromydis* Ronderos, and *oxymycteri* Ferris, all from cricetine rodents, appear to link *alata*-group species with the *quadridentata* group, while *wernecki* and *imitans* show characters in common with *H. disgrega* Ferris and its allies.

Unlike its closest relatives, *audax* and the new species, *alata* has the dorsal head setation like that of typical species of *Hoplopleura*, and the seta medial to the mesothoracic spiracle is long, not short. All the abdominal plates are well developed in both sexes of *alata*, and sword-shaped or inflated setae are present both dorsally and ventrally. The female has 3 sternal plates and rows of setae on each of the typical abdominal segments (15 in all, anterior to the genital plate, which is divided into 2 plates).

21. *Hoplopleura audax* Ferris

(Fig. 161, 162, 166, 170, 173, 181, 183, 186-188)

Hoplopleura audax Ferris, 1921:125, Fig. 82, 83.

Pterophthirus audax Ewing, 1923:148.—Ferris, 1923:281.—Werneck, 1942:317. — Hopkins, 1949:493.—Ferris, 1951:144, 147.

The female holotype and male allotype were taken from a museum skin of *Proechimys semispinosus calidior*, USNM 113273, North Ecuador: San Javier. A female paratype was taken from the skin of a *Tylomys mirae* (as *Nelomys mincae*) USNM 113303, collected from the same locality. Werneck (1942) recorded "numerous examples" ex *Proechimys guyannensis oris* (as

P. oris), Brazil: State of Pará, Abaté, and Hopkins (1949) included records of two collections from skins of *Proechimys semispinosus calidior* (as *P. cayennensis calidior*). The specimens from *Proechimys* species may be representatives of the new species described in this paper.

Two species are present in the type series of *Hoplopleura audax* Ferris. The female holotype, from "*Proechimys semispinosus*" (Fig. 82 and 83*a* of Ferris, 1921), and the female paratype from *Tylomys mirae* are conspecific. The male allotype (Fig. 82 and 83*b* of Ferris, 1921) is a specimen of a new species described in this paper. Hopkins (1949), in speaking of a doubtful record of the biting louse *Gyropus setifer* from *Proechimys semispinosus* (USNM skin 113273—the type host of *audax* Ferris), said that *Hoplomys gymnurus* was taken from the same locality and suggested that contamination may have taken place. Probably contamination

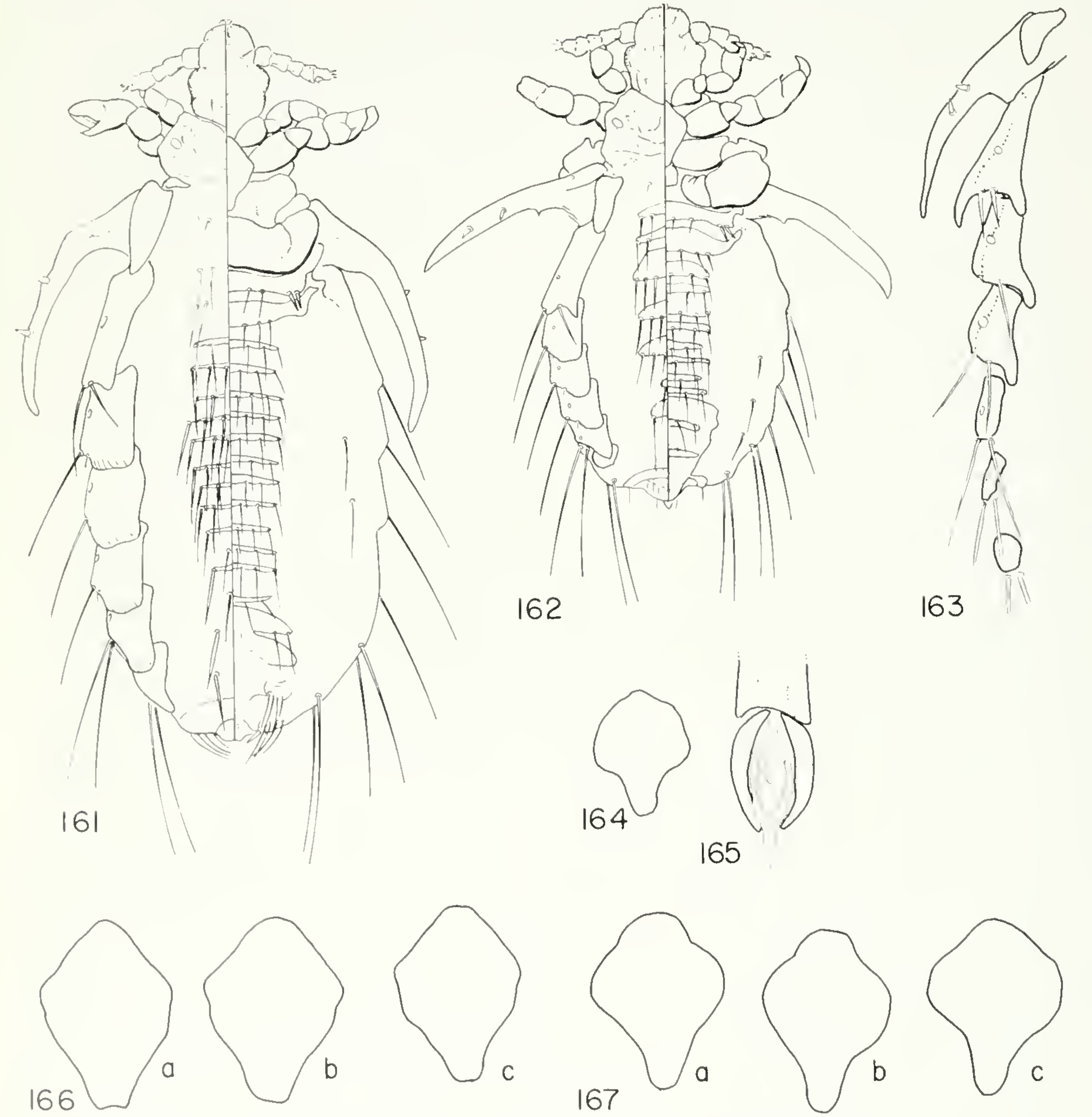


Fig. 161-167. *Hoplopleura alata* group. 161. *H. audax* Ferris, female, Panama, ex *Hoplomys gymnurus*, 4038; 162, same, male; 163, *H. alata* Ferris, paratergal plates, female paratype; 164, same, thoracic sternal plate; 165, same, aedeagus; 166, *H. audax*, thoracic sternal plate (*a*, holotype; *b*, female paratype, Ecuador, ex *Tylomys mirae*; *c*, female, Panama, ex *H. gymnurus*, 1038); 167, *H. splendida*, new species, thoracic sternal plate (*a*, female holotype; *b*, male paratype, Ecuador, ex *Proechimys semispinosus*, USNM-113273 [allotype of *H. audax* Ferris]; *c*, female, Brazil, ex *P. guyannensis*, RO-8571).

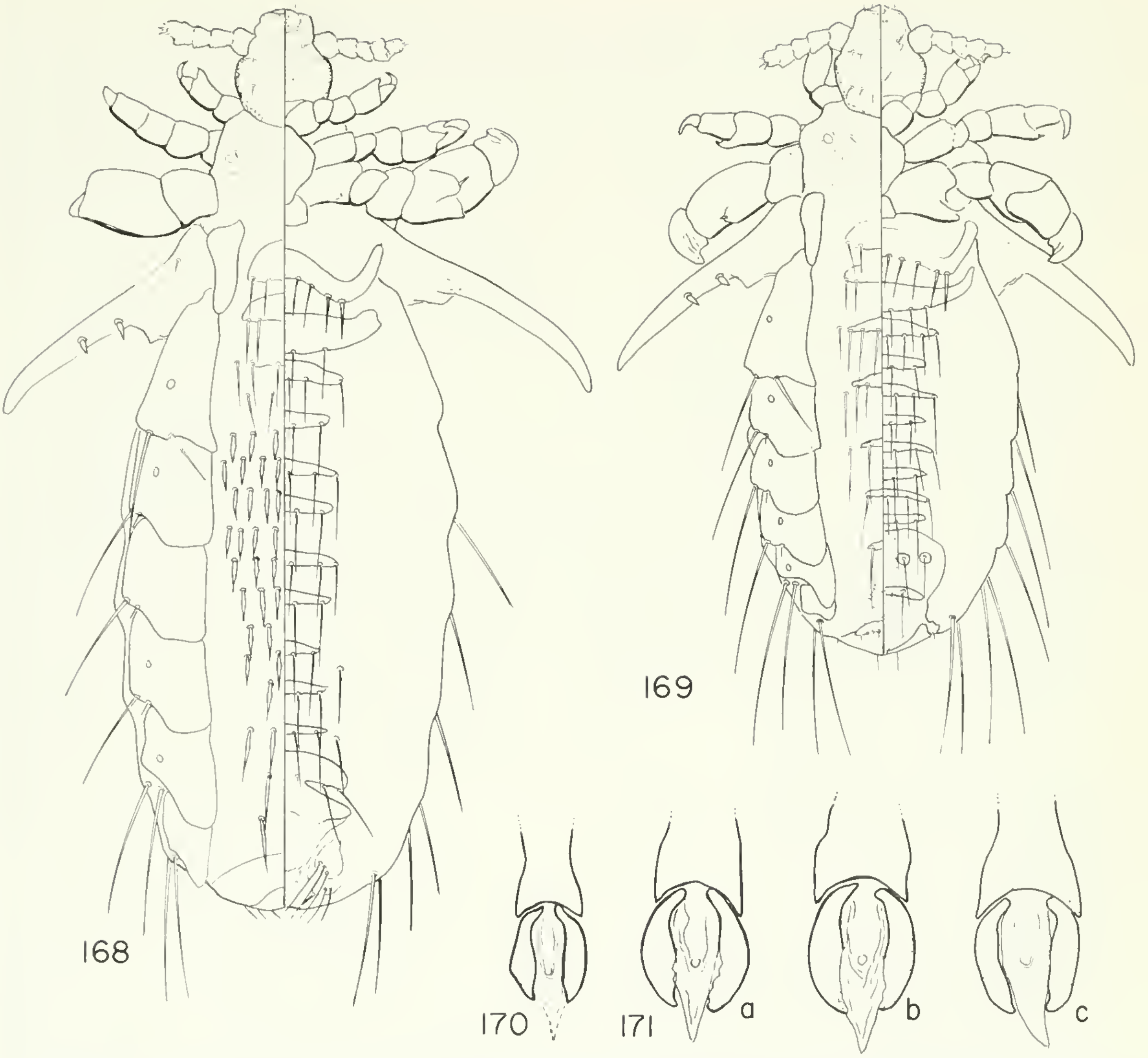


Fig. 168-171. *Hoplopleura alata* group. 168. *H. splendida*, new species, holotype; 169, aedeagus: 170, *H. audax* Ferris, Panama, ex *Hoplomys gymnurus*, 4038; 171, *H. splendida*, aedeagus (*a*, allotype; *b*, Brazil, ex *Proechimys guyannensis*, RO-8571; *c*, paratype, Ecuador, ex *Proechimys semispinosus*, USNM-113273 [allotype of *H. audax* Ferris]).

also occurred with the holotype of *H. audax*, which may have been from *Hoplomys gymnurus*, not *Proechimys semispinosus*. Whether the record of *audax* from *Tylomys mirae* is valid remains to be seen.

From the collections of the U.S. National Museum, I have examined 3 females and 1 male of true *audax* ex *Hoplomys gymnurus*, Panama: Cerro Azul. 29-I-58, R. M. Altman collector, no. 4038; and a female as above but Agnadulce, 9-IX-57, no. 4086. I have also seen the female holotype and the paratype ex *Tylomys mirae*.

Diagnosis

Separable from all described species of *Hoplopleura* except *alata* Ferris in having paratergal plate II greatly prolonged apically and bearing 2 thornlike setae medially. Distinguished from *alata* by having the apical lobes of paratergal plates III-VI squared or truncate, not acute or missing (compare Fig. 163 and 187), and in having a short, not a long, seta medial to the mesothoracic spiracle.

Lengths

Female holotype, 1.2 mm; paratype, 1.3 mm; Panama specimens, females, 1.25 mm; male, 0.9 mm.

Redescription

Female (Fig. 161): *Head* (Fig. 181, 183, 186). Preantennal area with strong dorsal sclerotization; postantennal angles evident, posterolateral head margins somewhat indented below these angles, giving slightly bulbous appearance. Principal dorsal seta longer than other dorsal setae. *Thorax.* Sternal plate (Fig. 166) large, squared posteroapically, bluntly angled anteriorly; posterolateral margins not concave. Seta medial to mesothoracic spiracle small. *Abdomen.* Each typical segment of abdomen with usual 3 dorsal rows of setae, and with 3 ventral rows on typical segments; anterior to coalesced genital plate the total is 14 rows. All abdominal setae thin, long; tergal rows of segments 3-5 accompanied by narrow but defined plates; all sternal rows with plates; sternal plate of segment 2 with 2 close-set thornlike setae laterally on each side (Fig. 173). First sternal

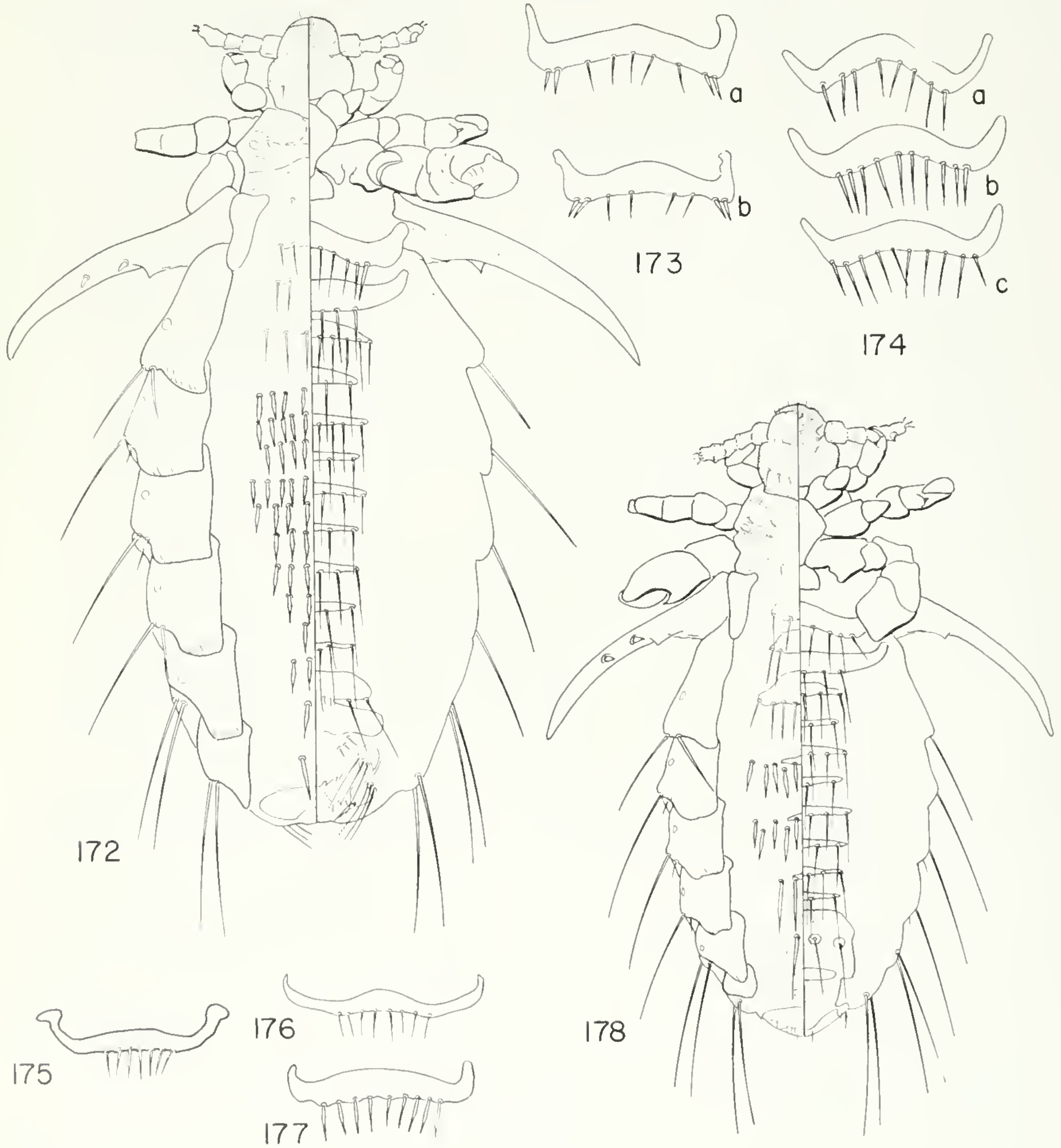


Fig. 172-178. *Hoplopleura alata* group. 172, *H. splendida*, new species, female, Brazil, ex *Proechimys guyannensis*, RO-8571. Sternal plate of second abdominal segment: 173, *H. audax* Ferris (*a*, holotype; *b*, female, Panama, ex *Hoplomys gymnurus*, 4038), 174, *H. splendida* (*a* and *b*, female, Venezuela, ex *P. guyannensis*; *c*, male paratype, Ecuador, ex *Proechimys semispinosus*, USNM-113273 (allotype of *audax* Ferris); 175, *H. alata* Ferris, female paratype; 176, *H. wernecki* (Guimarães), female paratype; 177, *H. imitans* (Werneck), male, Uruguay, ex *Cavia* species, AMNH-260409, 178, *H. splendida*, male, Brazil, ex *P. guyannensis*, RO-8571.

plate of segment 3 lacking modified setae but laterally approaching corresponding paratergal plates. Ventrally with 2 or more setae laterally, far removed from sternal plates. Paratergal plates (Fig. 187, 188) with plate II prolonged dorsoapically into winglike process bearing 2 short, thornlike setae mediodorsally; plates III-VIII entirely on dorsum, all lacking ventral apical lobe; III with acute dorsoapical lobe and 2 long apical setae; IV-VI with short squared dorsoapical lobe and 1 long and 1 short to minute apical setae; plates VII-VIII with usual pair of long setae and rounded-acute dorsoapical lobe. Genital plate entire. Genital seta short, stout.

Male (Fig. 162): As female except for usual sexually dimorphic characters. *Abdomen.* Typical segments with 1 tergal, 2 sternal plates each; these well developed on segments 2-5 dorsally, but obsolescent on 6-7. Ventral plates normal, all present. Tergal setae thin, none short or sword like; sternal setae also thin. Setae present ventrolaterally, distant from plates. Paratergal plates (Fig. 188) as in female, except plate VIII lacks an apical lobe. *Aedeagus* (Fig. 170). With parameres slightly angulate laterally, not strongly convex; pseudopenis in specimen drawn turned back upon itself, probably as shown by dotted lines.

22. *Hoplopleura splendida*, new species*

(Fig. 167-169, 171, 172, 174, 178-180, 182, 185, 189-191)

Hoplopleura audax Ferris, 1921:125, Fig. 82 (male), 83*b* (*partim*, male only). — ?Werneck, 1942:317. — ?Hopkins, 1949:493 (probably the records from *Proechimys guyannensis* (as *P. cayennensis*), records from other species of *Proechimys*).

Type Data: Female holotype, male allotype, 49 female and 27 male paratypes, ex *Proechimys guyannensis* (SVP 12599), Venezuela: Bolivar, 146 km S, 7 km E Ciudad Bolivar, 306 m elev., 5-IV-67, Peterson team collectors. Other paratypes, all from *P. guyannensis* and *P. semispinosus*, number 155 females and 77 males in 57 collections from various localities in the states of Bolivar, Trujillo, Yaracuy, T. F. Amazonas, Falcon, Carabobo, Apure, Barinas, and Zulia. Also included in the series of paratypes is the allotype (male) of *audax* Ferris, from a skin of *Proechimys semispinosus*, USNM-113273, North Ecuador: San Javier. There were 35 nymphs of various stages associated with the Venezuelan adults listed above.

Also Examined: 68 females, 28 males, and 14 nymphs in 37 collections from *Proechimys* species, various Venezuelan localities; and other specimens (all from USNM) as follows: 2 females ex *P. guyannensis*, Bolivia: A. de Guarayos, Beni, 8-VI-64, P. Hershkovitz, collector, 5774; 1 female and 1 male ex *Proechimys guyannensis trinitatis*, Trinidad: Cumaca, 21-VI-51, T. H. G. Aitken collector, TRVL-147; 1 male as above but 3-VII-54, TRVL-239; 3 females and 1 male from rat (probably *Proechimys*) as above but 19-VII-54, TRVL-206; 3 females from a skin of *Proechimys semispinosus calidior*, USNM-113275, Ecuador: San Javier (from the same group of skins that yielded the type series of *audax* Ferris).

With certain reservations, discussed later, I also place with *H. splendida*, new species, a series of 15 females and 5 males taken in three collections ex *Proechimys guyannensis*, Brazil: Amapá Territory, Serra do Navio, RO-8571 and RO-8656; and Pará, Belém, Utinga Forest, RO-8576, T. H. G. Aitken collector, Rockefeller Foundation.

Diagnosis

Close to *audax* Ferris. Both sexes separable from *audax* by lacking paired, short, thornlike apical setae on the second abdominal sternal plate (Fig. 174), and with the postantennal head margins smoothly convex, not at all bulbous anteriorly (Fig. 182, 184, 185). Further separable in the female by lacking abdominal tergal plates below segment 3 and by having the tergal rows below segment 3 composed of short, sword-shaped setae (Fig. 168, 172) and in having 2, not 3, rows of sternal setae per typical abdominal segment, i.e., with 11 (sometimes 10) rows of sternal setae anterior to the coalesced genital plates. The male differs from *audax* by having the aedeagus larger and with the parameres smoothly convex.

Lengths

Female holotype, 1.5 mm; male allotype, 1.1 mm; female paratypes (extended), 1.3-1.55 mm; male paratypes, 0.95-1.15 mm.

Description

Female (Fig. 168): *Head* (Fig. 185, male). Shape somewhat dependent on amount of flattening during mounting, preantennal area and its dorsal sclerotization somewhat flattened, this sclerotization narrower medially; lateral postantennal margins evenly convex; principal dorsal seta slightly larger than other dorsal setae.

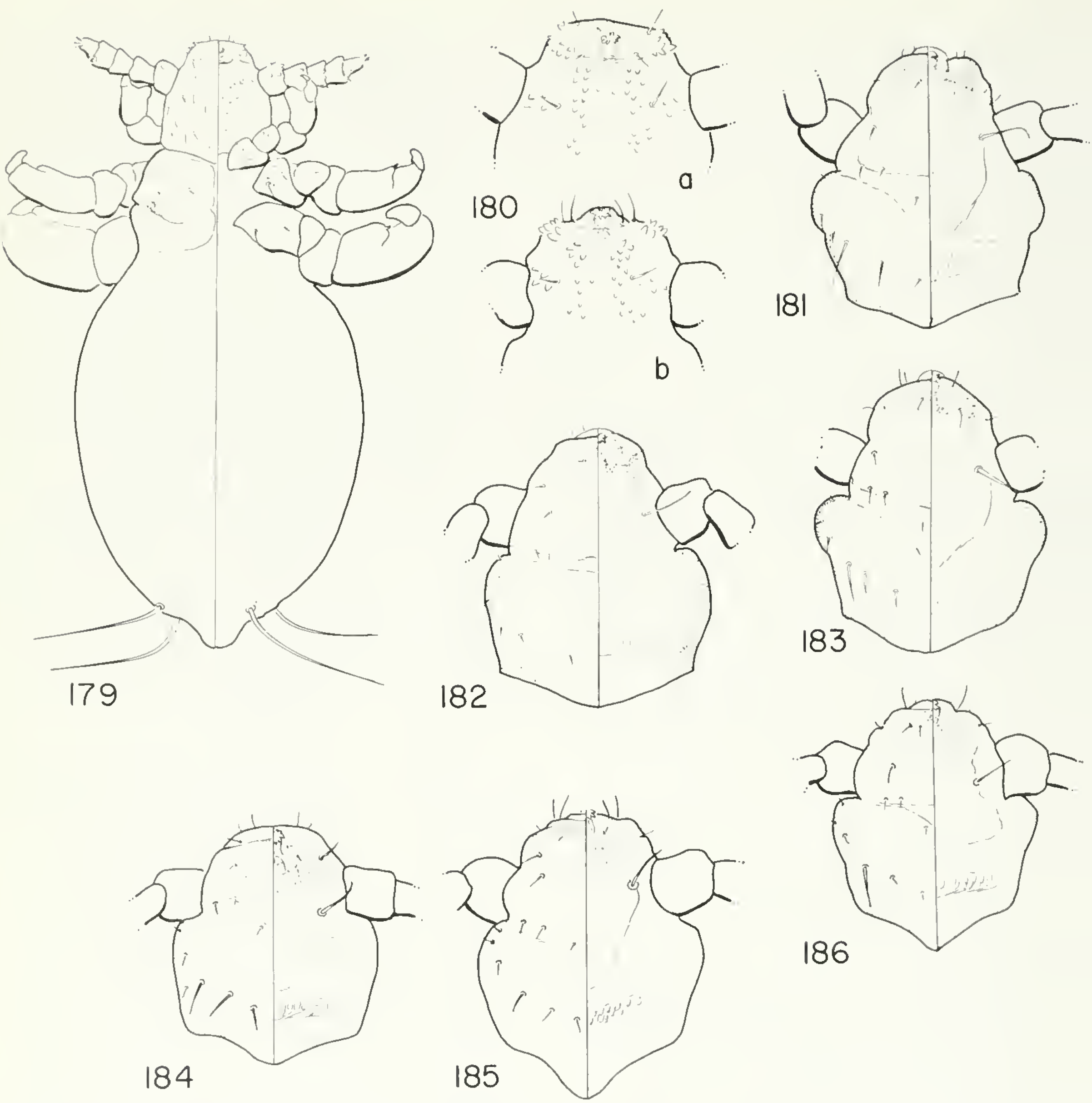


Fig. 179-186. *Hoplopleura alata* group. 179, *H. splendida*, new species, nymph, third instar, Falcon, ex *Proechimys semispinosus* (SVP 24145); 180, same, anterior of head, ventral view (*a*, as figure 179, *b*, Falcon, ex *Proechimys semispinosus* [SVP 24029]). Head: 181, *H. audax* Ferris, holotype; 182, *H. splendida*, male paratype, Ecuador, ex *Proechimys semispinosus*, USNM-113273 (allotype of *H. audax* Ferris); 183, *H. audax*, female paratype, Ecuador, ex *Tylomys mirae*; 184, *H. splendida*, male, Brazil, ex *P. guyannensis*, RO-8571; 185, same, allotype; 186, *H. audax*, female, Panama, ex *Hoplomys gymnurus*, 4038.

Thorax. Sternal plate (Fig. 167) rounded and bulbous anteriorly, posterolateral margins slightly concave, posterior apex rounded to rounded-truncate; seta medial to mesothoracic spiracle short. *Abdomen.* Typical segments with only 2 sternal rows of setae and 2 sternal plates each; apical setae of these rows long, thin. Ventrally, 2 or more setae off plates but not far removed laterally; sternal plate of segment 2 and first plate of segment 3 extended to approximate corresponding paratergal plates; both plates lacking modified setae, though on plate of segment 2 the most lateral 2 setae on either side may be somewhat larger than others. Dorsum lacking plates on segments 4-8; typical segments with 3 tergal rows of setae, these setae sword shaped. Paratergal plates (Fig. 191) with plate II having the dorsoapical lobe greatly elongate and bearing 2 thornlike setae dorsomedially; plates III-VIII lacking ventroapical lobes, placed entirely on dorsal surface; plate III with narrowly rounded dorsoapical lobe and 2 long apical setae; plates IV-VI with truncate dorsoapical lobe, also 1 very long and 1 small to minute apical setae; plates VII-VIII with usual pair of long apical setae with dorsoapical lobe narrowly rounded, especially that of VIII. Genital plate coalesced medially, genital seta short and stout.

Male (Fig. 169): Head and thorax as in female. *Abdomen.* Arrangement of tergal and sternal plates and accompanying setae as usual: 2 plates and rows of setae ventrally on typical segments and 1 plate and row of setae dorsally on each segment; the dorsal plates becoming obsolescent posteriorly. All abdominal setae long, thin. Paratergal plates (Fig. 189) as female except plate VIII lacks an apical lobe. *Aedeagus* (Fig. 171*a*). Parameres convex, strongly sclerotized, especially apically; pseudopenis slightly serrate, broad medially, tapering to acute apex.

Nymph (Fig. 179): In all stages the head is similarly shaped and the abdomen bears 2 pairs of long subterminal setae. As with most nymphs of *Hoplopleura*, third tibiotarsus of third instar much larger than second tibiotarsus. In second instar this difference less marked; in first instar these tabiotarsi equal in size. Unlike many *Hoplopleura*, dorsal thoracic seta not prolonged in first instar. Head shape depends upon amount of flattening during mounting (Fig. 180). Head ventrally with many small tubercles, those of medial portion rounded apically and very small. Dorsal head setae strong, principal dorsal seta only somewhat longer than others. Coxae rugose to tuberculate. Thoracic dorsal setae small to minute. Abdomen leathery, slightly scaly; anal lobe not extended.

Discussion

The series from Brazilian *Proechimys guyannensis* differs sufficiently to merit illustration and comment. The head (Fig. 184) is slightly broader than in Venezuelan specimens and the lateral postantennal head margins are more nearly parallel, though slight flattening during mounting of the Venezuelan material may be responsible for the difference. Male aedeagi (Fig. 171*a*, *b*) are similar, and length of the various dorsal head setae varies in both populations. Paratergal plates are similar, but the Brazilian specimens have the shorter of the apical setae on plates IV-VI usually longer than in the Venezuelan series. The thoracic sternal plate is usually broader, the anterior apex less bulbous, and the posterior apex narrower than in the Venezuelan specimens (Fig. 167*c*). Females of both populations have similar abdominal setation (Fig. 168, 172) but males differ. Brazilian males have the tergal setae on segments 4-6 sword shaped, while in the Venezuelan series these setae are always thin and long (Fig. 169, 178).

The Brazilian form may represent variation that is geographical, but not necessarily hostal, or its members may constitute a new species. The specimens from *Proechimys guyannensis trinitatis*, Trinidad, are like the Venezuelan series except that the lateral setae on the sternal plate of the second abdominal segment are definitely larger than the others, and they occur more distally than in the Venezuelan and Brazilian forms, being reminiscent of the configuration found in *audax*. The 2 females from Bolivian *P. guyannensis* are like the Venezuelan series. *H. audax*, *H. splendida*, new species, and the Brazilian population could represent a former cline that, through prolonged geographical (and hostal?) isolation, developed into 2 or possibly 3 species. Now *audax* and *splendida* from Venezuela occur sympatrically in some areas and possibly on the same species of host, though this seems unlikely. The Venezuelan and Brazilian populations, on the other hand, may be allopatric. Of particular interest is the difference in number of abdominal sternal plates in females of *audax* and *splendida*. In both sexes, the number of abdominal plates has been considered an important character in *Hoplopleura*. However, a similar difference occurs in another pair of very closely related species of *Hoplopleura*—*hirsuta* Ferris and *arizonensis* Stojanovich and Pratt—from *Sigmodon hispidus*. Thus, perhaps this character is not as indicative of broad separation of species as formerly thought.

23. *Hoplopleura wernecki* (Guimarães)

(Fig. 176, 200, 204, 205)

Pterophthirus wernecki Guimarães, 1950:83, Figs. 1-10.—Ferris 1951:144, 147.

The male holotype (no. 46.016) and female allotype (no. 46.017), 461 females and 138 males, and numerous nymphs constituted the type series. They were collected from *Proechimys i. iheringi*, Brazil: State of São Paulo, Boracéia. *H. wernecki* was not represented in the Venezuelan collections. I have examined a pair of paratypes from the collections of the U.S. National Museum.

Discussion

As with *alata* Ferris, *audax* Ferris, and *splendida*, new species, *wernecki* has the dorsoapical lobe of paratergal plate II extended into a long process, but rather than bearing 2 short, thornlike setae medially on the process, there is 1 long seta in the usual position at the base of the extended lobe (Fig. 200). The female, like *imitans* (Werneck) and *alata*, has 15 sternal rows of setae and plates anterior to the 2 genital plates (in all these species, the genital plate remains in two parts, not coalesced as in *audax* and *splendida*, new species). That is, there are 3 ventral rows of setae on each of the typical abdominal segments. Like typical *Hoplopleura*, the principal dorsal head seta is much longer than the other dorsal setae, and the paratergal plates wrap around the lateral margins of the abdomen instead of occurring only dorsally (Fig. 200, 204). As in *audax* and *splendida*, new species, the female has 1 apical lobe on paratergal plate VII, while this lobe is missing in the male. The aedeagus is similar to those of *alata*, *splendida*, new species, *audax*, and *imitans*. The pseudopenis is not so narrowed api-

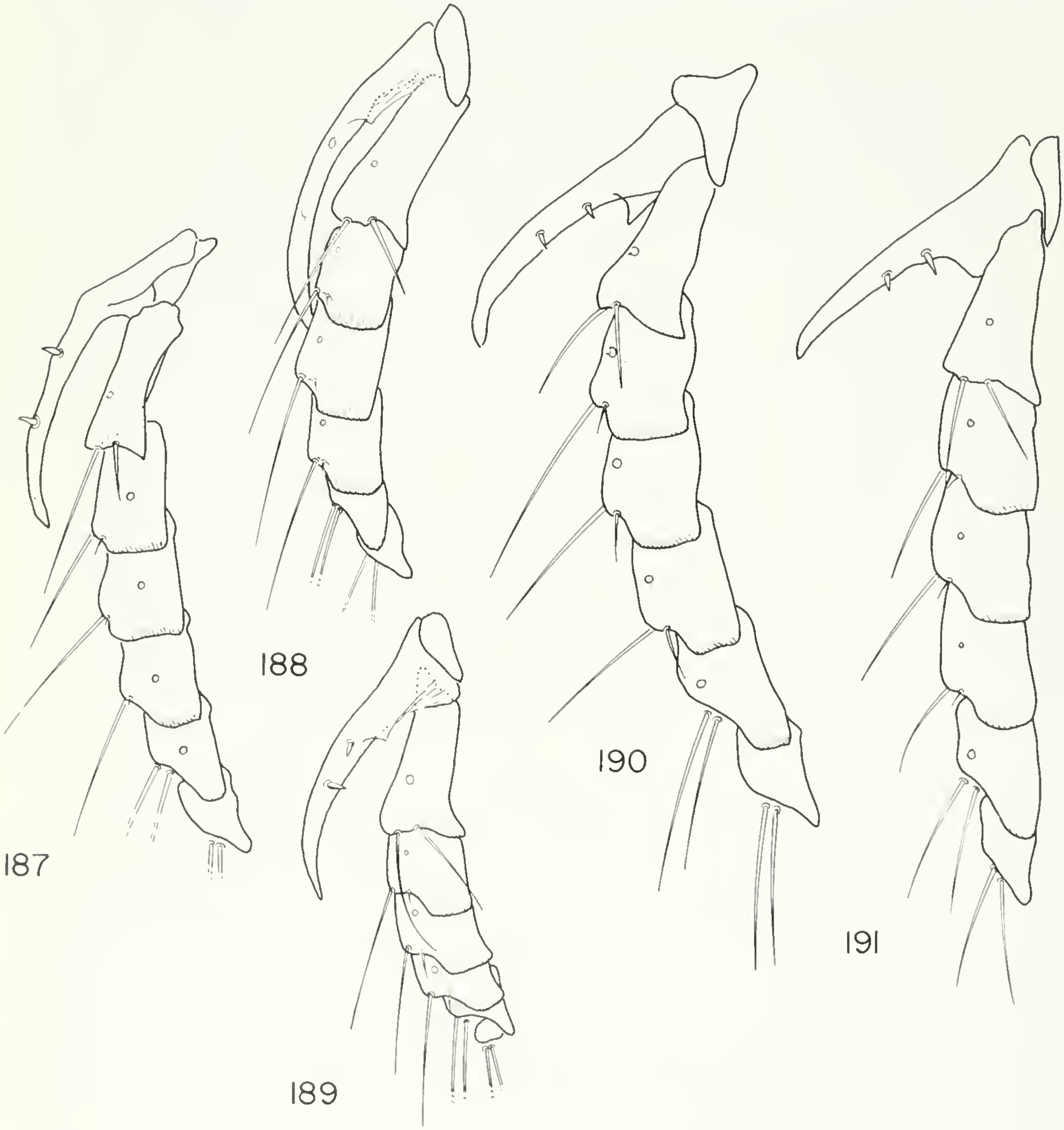
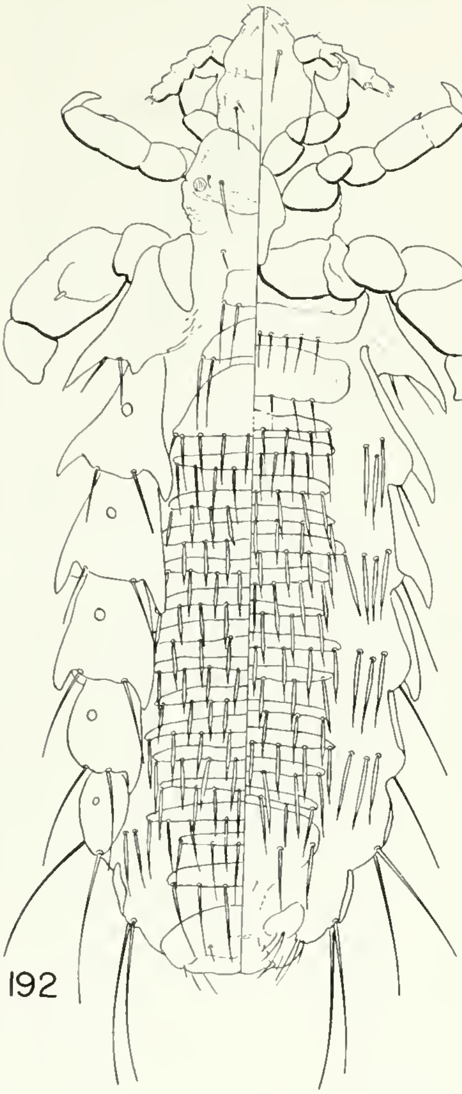
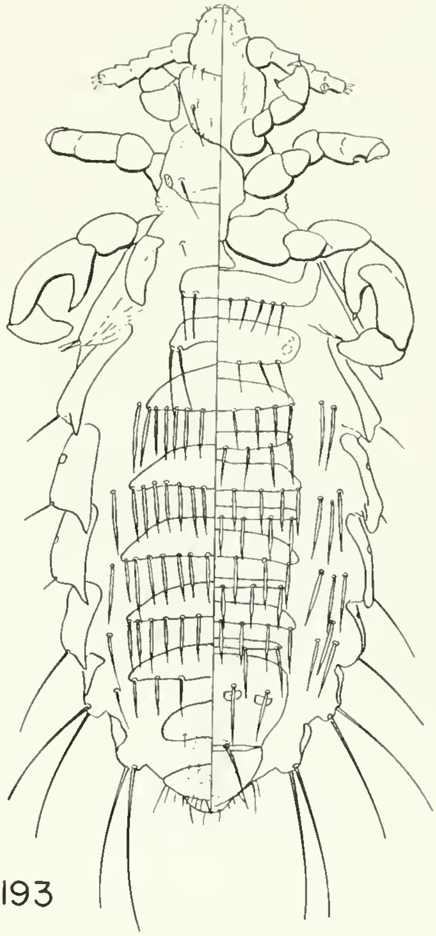
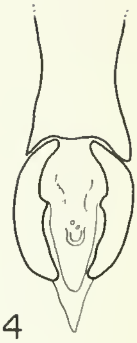
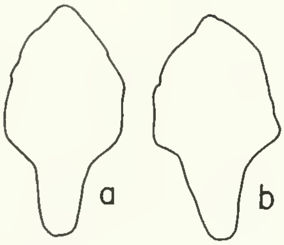


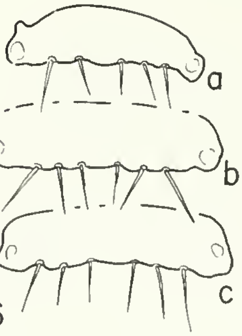
Fig. 187-191. *Hoplopleura alata* group, paratergal plates. 187, *H. audax* Ferris, female, Panama, ex *Hoplomys gymnurus*, 4038. 188, *H. audax*, holotype; 189 *H. splendida*, new species, allotype; 190, same, female, Brazil, ex *Proechimys guyannensis*, RO-8571; 191, same, holotype.


192


193


194


195


196

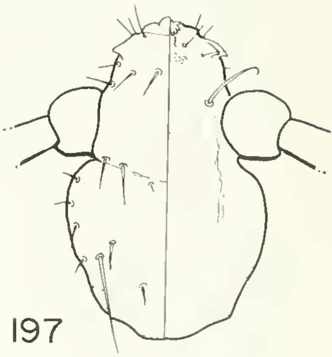

197

Fig. 192-197. *Hoplopleura imitans* (Werneck). 192, female, South America, ex *Cavia pamparum* (British Museum); 193, male, Uruguay, ex *Cavia* species; 194, aedeagus, same; 195, thoracic sternal plate (*a*, female, South America, ex *C. pamparum*; *b*, male, Uruguay, ex *Cavia* species); 196, first sternal plate of third abdominal segment (*a*, male, Uruguay; *b* and *c*, female, South America); 197, head, male, Uruguay.

cally as in *alata*, but narrower than that of the other species, and the parameres are less convex laterally than in any of the other species.

The second nymph of *wernecki* (figured by Guimarães) is very like that of *splendida*, new species.

24. *Hoplopleura imitans* (Werneck)
(Fig. 177, 192-197, 201-203)

Pterophthirus imitans Werneck, 1942:318, Fig. 1-5.—Guimarães, 1950:83.—Ferris, 1951:144, 147.

The male holotype, female allotype, and 2 female paratypes were collected from *Cavia aperea*, Brazil: State of São Paulo, Santo Amaro. *H. imitans* was not represented in the Venezuelan collections. I have seen specimens agreeing with the original description as follows: 6 females ex *Cavia pamparum*, South America (in the Zoological Society of London Gardens), 20-III-69, British Museum (Natural History); a single male from *Cavia* sp., Uruguay: Department of Lavalleja, 25-IV-63, S. Anderson collector, AMNH 206409, American Museum of Natural History; and from U.S. National Museum, 1 female (lacking the head), from the skin of *Cavia pamparum*, USNM 236344, Argentina: Chaco, Las Palmas, 1-VII-20, A. Wetmore collector.

DISCUSSION

The geographical range of *imitans* is apparently broad, and the host range is unknown, though probably only species of *Cavia* are concerned. In some ways, *H. imitans* more nearly approaches typical species of *Hoplopleura* than other *alata*-group species. The paratergal plates (Fig. 201-203) are quite typical, except that the dorsoapical lobe of II is somewhat prolonged, its appearance apparently somewhat dependent on position. The female (Fig. 192) has 3 rows of sternal setae and 3 sternal plates on each typical abdominal segment (15 in all, anterior to the divided genital plate), and the dorsal setation of the head is also typical. The first sternal plate of abdominal segment 3 does not extend to the corresponding paratergal plate (Fig. 192, 193), and its setation is somewhat variable, with the lateral setae sometimes slightly enlarged and set at an angle, more or less as in typical species of *Hoplopleura* (Fig. 196, *a-c*). The aedeagus (Fig. 194) is similar to that of *audax* Ferris and *splendida*, new species, and, like these species, the length of the paratergal setae is quite variable (Fig. 201, 203). The preantennal area of the head approaches certain species now placed in *Eulinognathus* and a new *disgrega*-related species described here, by having 2 lateral toothlike projections (Fig. 197).

25. *Hoplopleura inusitata*, new species°
(Fig. 198, 199, 206-209, 213, 216)

TYPE DATA: Male holotype, female allotype, 3 female and 1 male paratypes, and 4 nymphs, ex *Echimys semivillosus* (SVP 35380), Venezuela: Lara, 10 km N El Tocuyo, 518 m elev., 22-VII-68, Tuttle team collectors; 1 male paratype (SVP 35375), as above; 1 female paratype and 1 nymph (SVP 44928), as above but 18-VII-68; 1 male paratype (SVP 35370), as above but 22-VII-68; 4 female and 1 male paratypes and 1 nymph (SVP 44717, 44822), as above but 17-VII-68.

DIAGNOSIS

Related to *disgrega* Ferris and *chilensis* Werneck. Like those species, the first sternal plate of the third abdominal segment does not bear modified setae and is not extended laterally to articulate with or approximate the corresponding paratergal plate. Both sexes of *inusitata* differ by having the thoracic sternal plate incomplete and poorly sclerotized (Fig. 216). Further separable in the female from both *disgrega* and *chilensis* by having 3 sternal plates on each of the typical abdominal segments.

LENGTHS

Male holotype, 1.25 mm; female allotype, 1.7 mm; female paratypes, 1.5-1.9 mm; male paratypes, 1.1-1.25 mm.

DESCRIPTION

MALE (Fig. 207): *Head* (Fig. 208). Longer than broad, preantennal area prominent, squared, bearing thornlike tubercles laterally at apex. Plate on venter of head large, covering entire surface except edges. One laterodorsal head seta almost as long as principal dorsal seta, other dorsal setae also well developed. Postantennal angles present, rounded, posterolateral margins slightly convergent posteriorly. Sensoria of antennal segments 4-5 very large; 2 short, stout setae dorsally on antennal segment 3 and 1 such seta on segment 4. *Legs.* Coxae well separated, third coxa of regular shape, lacking posterior processes, remainder of third leg not compressed. *Thorax.* Sternal plate (Fig. 216, female) free only at anterior and posterior apices; with medial elongate, irregularly sclerotized area. Seta medial to mesothoracic

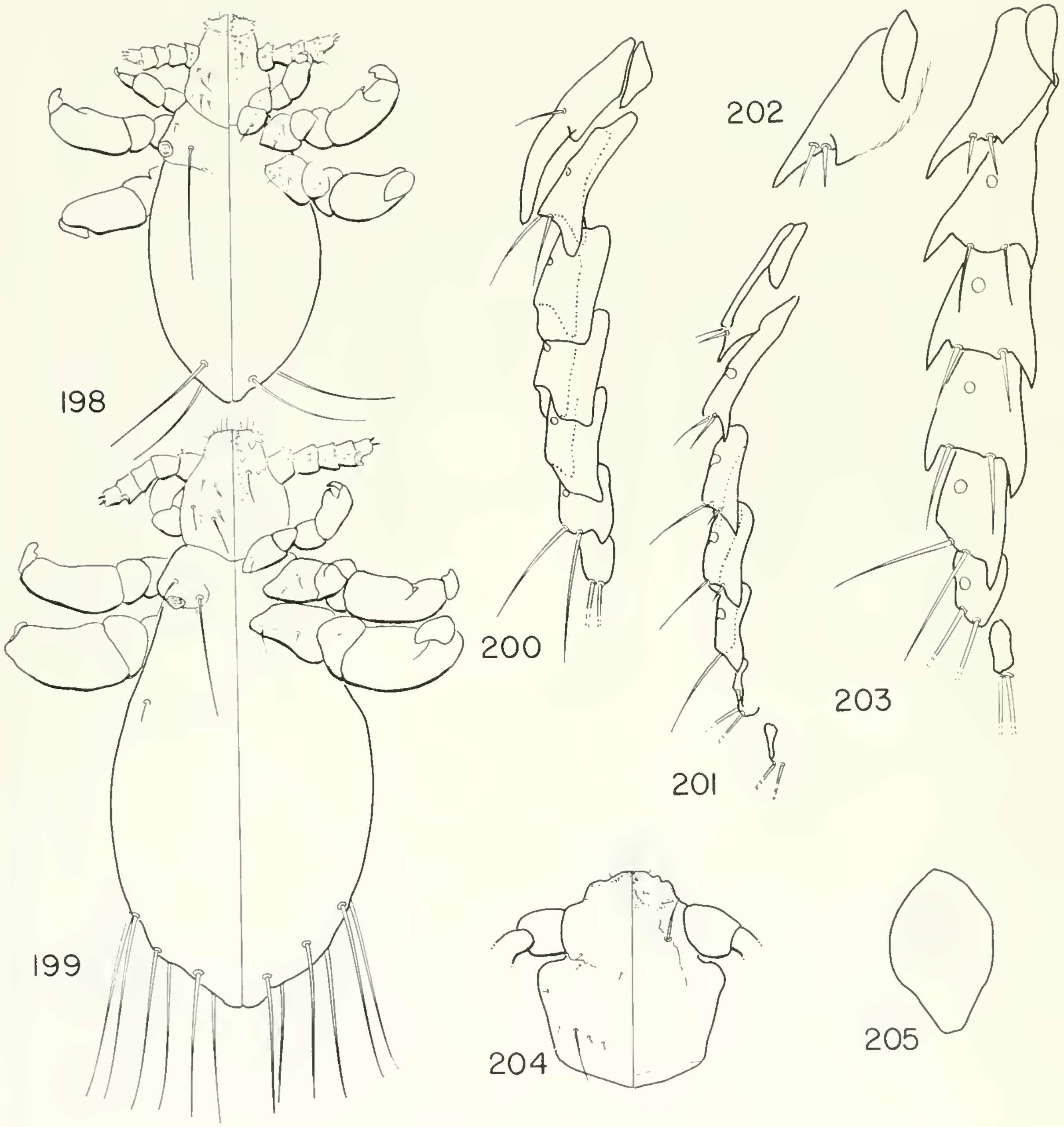


Fig. 198-205. *Hoplopleura* species. 198, *H. inusitata*, new species, nymph, first instar ex *Echimys semivillosus* (SVP 44717); 199 same, third instar, ex (SVP 44822). Paratergal plates: 200, *H. wernecki* (Guimarães), female paratype; 201, *H. imitans* (Werneck), male, Uruguay, ex *Cavia* species; 202, same, plate II, female, South America ex *Cavia pamparum*; 203, same, female, South America; 204, *H. wernecki*, head, male paratypes; 205, same, thoracic sternal plate, female paratype.

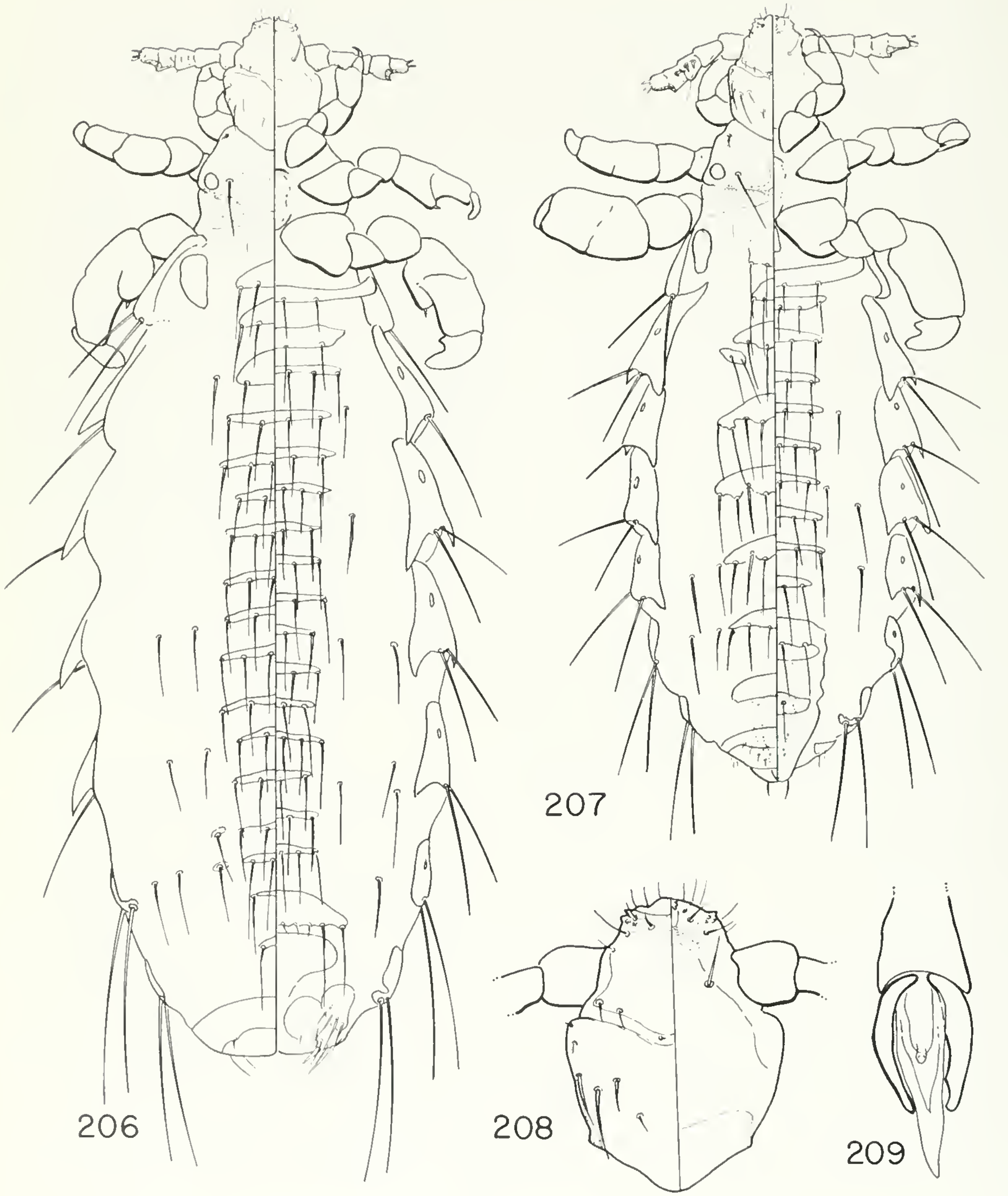


Fig. 206-209. *Hoplopleura inusitata,* new species. 206, allotype; 207, holotype; 208, head, male paratype (SVP 35380); 209, aedeagus, holotype.

spiracle long. *Abdomen.* Leathery and scaly, plates reduced, variously developed. Sternal plate of segment 2 extended laterally to approach corresponding paratergal plates, but first sternal plate of segment 3 not so extended, lacking enlarged setae. Remainder of abdominal plates as usual in genus, with 1 tergal and 2 sternal plates on each of typical segments, their apical setae long, thin; those of tergal plates appearing as two coalesced rows; posterior margin of plate bearing them scalloped. Several setae laterally off plates both dorsally and ventrally. Paratergal plates II-VIII (Fig. 213, female) each bearing 2 long apical setae; plates III-VI with both apical angles produced into narrow pointed lobes; plates VII-VIII lacking apical angles. *Aedeagus* (Fig. 209). With pseudopenis elongate, triangular, flexible, bladelike; extending almost half its length beyond apices of parameres.

Female (Fig. 206): Head, thorax, and legs as in male except dorsal setae of antennal segments 3-4 not as enlarged. *Abdomen.* As in male except for usual sexual dimorphism; 3 sternal and 3 tergal plates and rows of setae per segment, plates narrow and variously developed. Genital plate divided; genital seta short, stout.

Nymph (Fig. 198, 199): Typical of *Hoplopleura.* In all instars, head with ventral tubercles and preantennal corona of thornlike tubercles; antennae also tuberculate ventrally. Dorsal head setae well developed, 1 lateral seta almost as large as principal dorsal seta. *Third instar* (Fig. 199). With seta anterior to spiracle of mesothorax very well developed. Abdomen scaly, lacking plates or spiracles; with 1 small seta each side anterodorsally and 3 pairs of subterminal setae on each side; anal segment not elongate. *Second instar.* Similar to third but with anterodorsal thoracic seta short; lacking anterodorsal setae of abdomen; and with only 2 pairs of long subterminal setae on abdomen, each side. *First instar* (Fig. 198). Thorax and abdomen as in second instar except seta mesad to mesothoracic spiracle very long, and with only 1 pair of subterminal abdominal setae.

26. *Hoplopleura orinocoi*, new species*

(Fig. 210-212, 214, 215)

Type Data: Male holotype, 2 male paratypes ex *Mesomys hispidus* (SVP 16830), Venezuela: T. F. Amazonas, about 84 km SSE Esmeralda, 138 m elev., 16-III-67, Tuttle team collectors; 1 male paratype (SVP 17316), as above but 20-III-67. Female unknown.

Diagnosis

Close to *H. inusitata*, new species, *H. disgrega* Ferris, and *H. chilensis* Werneck. Like the latter 2 species, with the anteroventral head plate divided into 2 elongate posteriorly divergent sclerotizations. Separable from *disgrega* by having the apical paratergal setae thin, pointed, and longer than the plates bearing them. Distinct from *chilensis* by having the apical setae of paratergal plates III-VI all longer than the plate bearing them. Distinct from *inusitata*, new species, by having the head almost as broad as long (Fig. 211), with large, rounded postantennal angles and convex lateral postantennal margins; by having the anteroventral head plate divided; and by lacking tubercles on the preantennal head region. Further separable from *inusitata* in having the abdominal plates well developed and with many apical setae.

Lengths

Holotype, 1.3 mm; paratypes, 1.3-1.45 mm.

Description

Male (Fig. 210): *Head* (Fig. 211). Almost as broad as long; preantennal area not prolonged, anteriorly rounded; postantennal angles extended laterally, rounded; posterolateral margins convex, convergent posteriorly. Principal dorsal seta and accessory seta long, about same size; one of laterodorsal seta of similar size. *Legs.* Coxae well separated, third coxa of regular shape, lacking posterior projections, remainder of leg not compressed or otherwise modified. *Thorax.* With sternal plate (Fig. 215) separate only at anterior and posterior apices; oval and heavily sclerotized medially. Seta medial to mesothoracic spiracle long; also with well-developed seta directly anterior to spiracle. *Abdomen.* Sternal plate of segment 2 extended laterally to approach corresponding paratergal plates. First sternal plate of segment 3 not so extended, lacking enlarged setae. Tergal plates and sternal plates below segment 3 arranged as usual; 1 large tergal plate and 2 narrower sternal plates per typical segment. Apical setae of these plates numerous, long, thin, although dorsal ones somewhat inflated. Several setae off plates both dorsally and ventrally. Paratergal plates (Fig. 214) each with pair of long apical setae; plates III-VI with both apical angles extended into acute lobes; plates VII-VIII lacking lobes. *Aedeagus* (Fig. 212). With flexible bladelike pseudopenis extending well beyond apices of parameres.

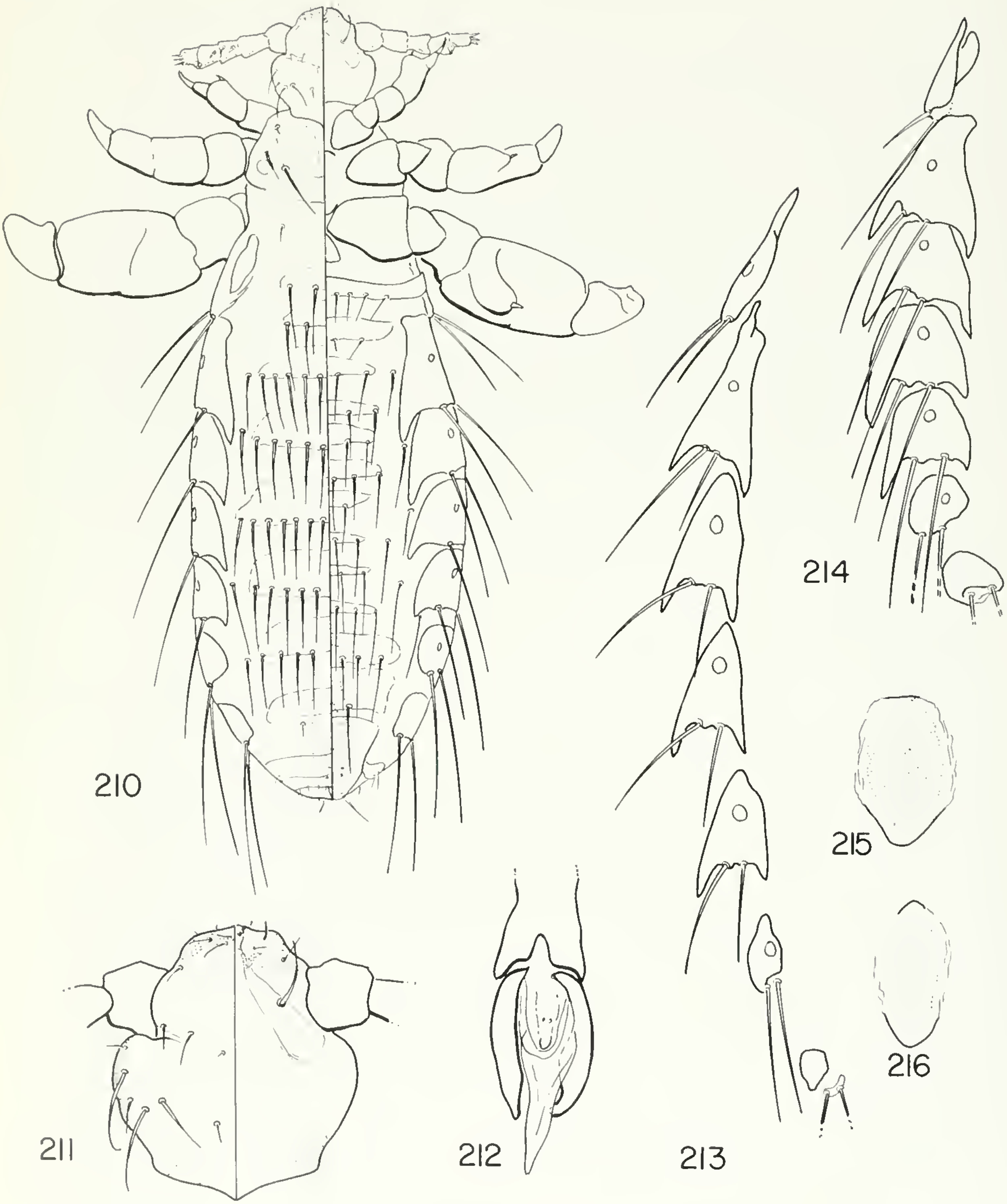


Fig. 210-216. *Hoplopleura* species. 210, *H. orinocoi*, new species, holotype; 211, same, head; 212, same, aedeagus; 213, *H. inusitata*, new species, paratergal plates, allotype; 214, *H. orinocoi*, paratergal plates, holotype; 215, same, thoracic sternal plate; 216, *H. inusitata*, thoracic sternal plate, allotype.

Genus *Fahrenholzia* Kellogg and Ferris

Fahrenholzia Kellogg and Ferris, 1915*a*:32.—Ferris, 1922:158.—Ferris, 1951:173.—Stojanovich and Pratt, 1961*b*:693.—Johnson, 1962: 416.

Type Species: *Fahrenholzia pinnata* Kellogg and Ferris (orig. design).

A discussion of the host relationships and geographical distribution of species of *Fahrenholzia* may be found in Stojanovich and Pratt (1961) and Johnson (1962). The latter reference also includes a revised description of the genus. Relationships of this very modified genus are in doubt. Ferris (1951) referred *Fahrenholzia* to the subfamily Polyplacinae of the Hoplopleuridae. All the known species are normal parasites of species of the family Heteromyidae, suborder Sciuromorpha. *Fahrenholzia* is limited to Central America, southwestern North America, and northern South America, where there is 1 species.

Fahrenholzia schwartzi Werneck*

Fahrenholzia schwartzi Werneck, 1952:70, Fig. 1-6.—Johnson, 1962:418, Fig. 14-17, 31, 38.

The type series was taken from *Heteromys anomalus anomalus*, Venezuela: Aragua, Sierra Maestra, Campamento Rafael Rangel. Johnson (1962) recorded *schwartzi* from *Heteromys anomalus* in Trinidad and Magdelena, Colombia.

Venezuelan Records

There were 121 females, 57 males, and 37 nymphs in 56 collections ex *Heteromys anomalus*, from various localities in Aragua, Barinas Dto. Federal, Falcon, Miranda, Monagas, Sucre, Trujillo and Zulia. The largest collection contained 9 females, 7 males, and 17 nymphs (SVP 14685), Sucre, 4 km S, 25 km E Carúpano, Manacal, 2-VIII-67. There were also 6 collections containing 5 females, 3 males, and 3 nymphs ex *Zygodontomys brevicauda* from T. F. Amazonas, Falcon, Miranda, and Sucre; 2 collections of 1 female each ex *Proechimys semispinosus*, Falcon and Sucre; and 3 collections of 1 nymph each, ex *Oryzomys albigularis*, Tachira and Dto. Federal.

Discussion

Adults of this species were figured and described by Johnson (1962). The association of *Heteromys* and *F. schwartzi* is very strong. Only 4 other anopluran species, in 9 collections, were taken from *Heteromys* during the Venezuelan survey. Three collections were of *Hoplopleura nesoryzomydis* Ferris, which is a normal parasite of *Zygodontomys*; and 4 were of *Hoplopleura multilobata* Werneck, which is normally found on *Oryzomys albigularis*. Cross infestation of the lice of *Heteromys*, *Zygodontomys*, and *O. albigularis* may therefore be a relatively common occurrence.

Genus *Neohaematopinus* Mjöberg

Neohaematopinus Mjöberg, 1910:160.—Ferris, 1923:237.—Ferris, 1951:185.

Type Species: *Haematopinus sciuropteri* Osborn (orig. design).

A full synonymy of *Neohaematopinus* may be found in the two papers by Ferris. There is only 1 species of this genus known to occur in South America, *N. semifasciatus* Ferris, *sensu lato*, discussed in this paper. Werneck (1948*b*) described as *Neohaematopinus longus*, a species from the hystricomorph rodent, *Abrocoma cinerea*, Peru. However, Ferris (1951) removed *longus* to the genus *Polyplax*. I have not seen specimens of *longus* but consider it likely that it is more closely related to *Hoplopleura* and/or "*Eulinognathus*-like" forms than to either *Neohaematopinus* or *Polyplax*.

Neohaematopinus semifasciatus Ferris, *sensu lato**

(Fig. 2)

Neohaematopinus antennatus semifasciatus Ferris, 1916*a*:100.

Neohaematopinus sciurinus, Ferris, 1923:244 (*partim*, sinks *semifasciatus*).

Neohaematopinus semifasciatus, Johnson, 1959: 586, Fig. 32.

Neohaematopinus "*sciurinus* group," Wenzel and Johnson, 1966:275.

The types of *N. semifasciatus* were from *Tamiasciurus douglasii*, USA: California, Yosemite National Park. This species also occurs on North American *Tamiasciurus hudsonicus*.

Venezuelan Records

Two females and 1 male ex *Sciurus gilvigularis* (SVP 17776), T. F. Amazonas, 108 km SSE Esmeralda, Rió Mavaca; 5 females, 8 males, 2 nymphs ex *Sciurus granatensis* (SVP 33246, 33274, 33365, 33478, 34256, 34263), Barinas Altamira.

Discussion

Members of the "*sciurinus* group" of *Neohaematopinus* were discussed by Johnson (1959). The only reliable differences found amongst the species were in shape and setation of the antennae. The Venezuelan specimens are assigned to *N. semifasciatus* Ferris because, like that species, the first antennal segment bears a large, spinelike seta on a marked posteroapical projection, and the second segment has a thornlike seta on its posterior margin (Fig. 2). Ferris (1923) listed a series of specimens of *Neohaematopinus "sciurinus"* from various squirrels from Mexico, Costa Rica, and Venezuela. Some of these may be *semifasciatus, sensu lato.* The "*sciurinus* group" specimens discussed by Wenzel and Johnson (1966), from Panamanian *Sciurus granatensis* and *S. variegatoides*, are morphologically indistinguishable from the Venezuelan series.

In the Venezuelan series, *N. semifasciatus, sensu lato*, occurred together with *Hoplopleura sciuricola* Ferris in 3 collections, and with *H. sciuricola* and *Enderleinellus venezuelae* Ferris in 2 collections (from *Sciurus granatensis*).

Genus *Polyplax* Enderlein

Polyplax Enderlein, 1904:142, 233.—Ferris, 1923: 183.—Ferris, 1951:199.—Johnson, 1960:48.

Type Species: *Pediculus spinulosus* Burmeister (orig. design.)

Complete synonymies and discussions of *Polyplax* may be found in the papers listed above. There is but one true *Polyplax* species in South America: *Polyplax spinulosa* (Burmeister), on introduced *Rattus* species. A second species, *longus* Werneck, has been attributed by Ferris (1951) to *Polyplax*. However, its affinities to this genus are doubtful (see discussion under genus *Neohaematopinus*).

Polyplax spinulosa (Burmeister)°

Pediculus spinulosus Burmeister, 1839, no. 8.

Polyplax spinulosa, Ferris, 1923:187.—Ferris, 1951:211.

Information on the distribution of this cosmopolitan species, originally described from specimens collected off European *Rattus norvegicus*, may be found in the Ferris papers.

VENEZUELAN RECORDS

There were 11 collections, including 27 females. 43 males, and 4 nymphs, ex *Rattus rattus*, from coastal or near coastal localities in Trujillo, Merida, Dto. Federal, Sucre, and Nueva Esparta. From *Proechimys semispinosus* there was one collection of 1 female and 1 male, Yaracuy and Carabobo, Urama; and ex *Oryzomys minutus*, 1 male, Merida, Paramito.

Hoplopleura pacifica Ewing (native to *Rattus exulans* but often found on *Rattus rattus* in tropical and subtropical regions, as well as in the southern United States) was not taken during the Venezuelan survey.

HOST-PARASITE LIST

In the following list, parasite names enclosed in square brackets represent infestations that possibly are normal, but are not common. Obvious accidental infestations or records based on questionable data are not included. The group to which each of the species of *Hoplopleura* belongs is indicated as follows: *E, erratica* group; A-F, *affinis-hesperomydis* complex; T, *travassosi* group; Q, *quadridentata* group; A-A, *alata* group; D, *disgrega* group.

Order: Rodentia

Suborder: Sciuromorpha

Family: Sciuridae

Sciurus igniventris.—	*Hoplopleura sciuricola* Ferris (E)
S. granatensis.—	*Enderleinellus venezuelae* Ferris *Hoplopleura sciuricola* Ferris (E) *Neohaematopinus semifasciatus* Ferris, *sensu lato*
S. granatensis nesaeus.—	*Enderleinellus insularis* Werneck
S. gilvigularis	*Neohaematopinus semifasciatus* Ferris, *sensu lato*

Family: Heteromyidae

Heteromys anomalus.—	*Fahrenholzia schwartzi* Werneck [*Hoplopleura nesoryzomydis* Ferris (Q)] [*Hoplopleura multilobata* Werneck (Q)]

Suborder: Myomorpha

Family: Cricetidae, Subfamily: Cricetinae	
Oryzomys (*Oryzomys*) *albigularis*.–	*Hoplopleura multilobata* Werneck (Q) [*Fahrenholzia schwartzi* Werneck]
O. (*Oryzomys*) *capito* (Brazil).–	*Hoplopleura brasiliensis* Werneck (T)
O. (*Oecomys*) *concolor*.–	*Hoplopleura travassosi* Werneck (T)
O. (*Oligoryzomys*) *fulvescens*.—–	*Hoplopleura travassosi* Werneck (T)
O. (*Microryzomys*) *minutus*.–	*Hoplopleura rimae*, new species (T)
Neacomys tenuipes.–	*Hoplopleura handleyi*, new species (T)
Nectomys squamipes.—–	*Hoplopleura quadridentata* (Neumann)
N. alfari.—–	*Hoplopleura oryzomydis* Pratt and Lane (Q)
Rhipidomys venustus.–	*Hoplopleura angulata* Ferris (T)
R. venezuelae.–	*Hoplopleura angulata* Ferris (T)
R. macconnelli.–	*Hoplopleura angulata* Ferris (T)
R. goodfellowi.–	*Hoplopleura angulata* Ferris (T)
R. couesi.–	*Hoplopleura angulata* Ferris (T)
R. caucensis.–	*Hoplopleura angulata* Ferris (T)
Thomasomys laniger.–	*Hoplopleura tiptoni*, new species (T)
T. lugens.–	*Hoplopleura indiscreta*, new species (T)
Akodon bogotensis.–	*Hoplopleura abeli*, new species (T)
A. urichi.–	*Hoplopleura aitkeni*, new species (A-F)
Zygodontomys brevicauda.–	*Hoplopleura nesoryzomydis* Ferris (Q) [*Fahrenholzia schwartzi* Werneck]
Holochilus brasiliensis.–	*Hoplopleura contigua*, new species (Q)
Sigmodon hispidus.–	*Hoplopleura arizonensis* Stojanovich and Pratt (E)
Anotomys trichotis.–	*Hoplopleura eximia*, new species (T)
Family: Muridae	
Rattus rattus.–	*Polyplax spinulosa* (Burmeister)
Suborder: Hystricomorpha	
Family: Echimyidae	
Proechimys guyannensis.–	*Hoplopleura splendida*, new species (A-A)
P. semispinosus.–	*Hoplopleura splendida*, new species (A-A)
Mesomys hispidus.–	*Hoplopleura orinocoi*, new species (D)
Echimys semivillosus.–	*Hoplopleura inusitata*, new species (D)

LITERATURE CITED

BURMEISTER, H. 1839. Genera Insectorum, Rhynchota. Numbers 8 and 10.

COOK, E. F., and J. R. BEER. 1959. The immature stages of the genus *Hoplopleura* (Anoplura: Hoplopleuridae) in North America, with descriptions of two new species. Journal of Parasitology 45:405-416.

ENDERLEIN, G. 1904. Lause-Studien. (1) Über die Morphologie, Klassifikation and systematische Stellung der Anopluren nebst Bemerkungen zur Systematik der Insektenordnungen. Zoologischer Anzeiger 28:121-147, 220-233.

EWING, H. E. 1923. New genera and species of sucking lice. Journal of the Washington Academy of Sciences 13:146-149.

FAHRENHOLZ, H. 1912. Diagnosen neuer Anopluren. Zoologischer Anzeiger 39:54-56.

FERRIS, G. F. 1916*a*. Notes on Anoplura and Mallophaga, from mammals, with descriptions of four new species and a new variety of Anoplura. Psyche 23:97-120.

———. 1916*b*. A catalogue and host list of the Anoplura. Proceedings of the California Academy of Sciences 6:129-213.

———. 1919. Contributions toward a monograph of the sucking lice. Part I. Stanford University Publications, University Series, 52 p.

———. 1921. Contributions toward a monograph of the sucking lice. Part II. Stanford University Publications, University Series, Biological Sciences 2:55-133.

———. 1922. Contributions toward a monograph of the sucking lice. Part III. Stanford University Publications, University Series, Biological Sciences 2:139-178.

———. 1923. Contributions toward a monograph of the sucking lice. Part IV. Stanford University Publications, University Series, Biological Sciences 2:183-270.

———. 1932. Contributions toward a monograph of the sucking lice. Part V. Stanford University Publications, University Series, Biological Sciences 2:275-413.

———. 1951. The sucking lice. Memoirs of the Pacific Coast Entomological Society 1:1-320.

Guimarães, L. R. 1950. Sôbre uma nova espécie de *Pterophthirus* Ewing, 1923 (Anoplura). Papéis Avulsos do Departamento de Zoologia 9:83-88.

Hopkins, G. H. E. 1949. The host-associations of the lice of mammals. Proceedings of the Zoological Society of London 119:387-604.

Johnson, P. T. 1959. The rodent-infesting Anoplura (sucking lice) of Thailand, with remarks on some related forms. Proceedings of the United States National Museum 110:569-598.

———. 1960. The Anoplura of African rodents and insectivores. United States Department of Agriculture. Technical Bulletin (1211):116 p.

———. 1962. The species of *Fahrenholzia* Kellogg and Ferris from spiny pocket mice (Anoplura: Hoplopleuridae). Annals of the Entomological Society of America 55:415-428.

———. 1964. The hoplopleurid lice of the Indo-Malayan Subregion (Anoplura: Hoplopleuridae). Miscellaneous Publications of the Entomological Society of America 4:67-102.

Kaneko, K. 1956. Studies on the murine lice in Japan (Part 2). Description of *Hoplopleura himenezumi* n. sp. (Hoplopleuridae, Anoplura) collected from *Apodemus argenteus argenteus*. Bulletin of Tokyo Medical and Dental University 3:143-147.

Kellogg, V. L., and G. F. Ferris. 1915*a*. The Anoplura and Mallophaga of North American mammals. Stanford University Publications, University Series. 74 p.

———. 1915*b*. Anoplura and Mallophaga from Zululand. Annals of the Durban Museum 1:147-158.

Kim, K. C. 1965. A review of the *Hoplopleura hesperomydis* complex (Anoplura, Hoplopleuridae). Journal of Parasitology 51:871-887.

———. 1966*a*. The species of *Enderleinellus* (Anoplura, Hoplopleuridae) parasitic on the Sciurini and Tamiasciurini. Journal of Parasitology 52:988-1024

———. 1966*b*. The nymphal stages of three North American species of the genus *Enderleinellus* Fahrenholz (Anoplura: Hoplopleuridae). Journal of Medical Entomology 2:327-330.

Kuhn, H.-J., and H. W. Ludwig. 1966. Sucking lice of the genus *Hoplopleura* (Anoplura: Insecta) from Australian Muridae. Annals and Magazine of Natural History ser. 13, 9:657-674.

Mjöberg, E. G. 1910. Studien über Mallophagen und Anopluren. Arkiv for Zoologi 6:1-297.

Neumann, L. G. 1909. Notes sur les Pédiculidés. Archives de Parasitologie 13:497-537.

Pratt, H. D., and J. E. Lane, Jr. 1951. *Hoplopleura oryzomydis* new species, with notes on other United States species of *Hoplopleura* (Anoplura: Haematopinidae). Journal of Parasitology 37:141-146.

Ronderos, R. A. 1965. Notas sobre Anoplura Argentinos (Insecta). Neotropica 11:46-49.

Ronderos, R. A., and J. J. Capri. 1965. Anoplura Argentinos. I. (Insecta). Physis, Buenos Aires 25(69):37-39.

———. 1966. Anoplura Argentinos. II. (Insecta). Neotropica 12:95-98.

Sasa, M. 1950. Note on the blood-sucking lice (Anoplura) of rodents in Japan (Part 1). Japanese Journal of Experimental Medicine 20:715-717.

Stojanovich, C. J., and H. D. Pratt. 1961*a*. Key to the North American sucking lice in the genera *Hoplopleura* and *Neohaematopinus* with descriptions of two species: (Anoplura: Hoplopleuridae). Journal of Parasitology 47:312-316.

———. 1961*b*. *Fahrenholzia texana*, new species, with a key to the United States species of *Fahrenholzia* (Anoplura: Hoplopleuridae). Annals of the Entomological Society of America 54:693-696.

Wenzel, R. L., and P. T. Johnson. 1966. Checklist of the sucking lice of Panama p. 273-279. R. L. Wenzel and V. J. Tipton [eds], Ectoparasites of Panama.

Werneck, F. L. 1932*a*. Sur une nouvelle espèce de pou (*Hopopleura* [*sic*] *brasiliensis*). Société de Biologie de Rio de Janeiro (Société de Biologie de Paris. Comptes Rendus) 109:754-755.

———. 1932*b*. Nova especie de Anoplura (Haematopinidae). Memórias de Instituto Oswaldo Cruz 26:235-237, Plates XLV and XLVI.

———. 1932*c*. Sôbre uma especie nova de *Hoplopleura* (Anoplura, Haematopinidae). (Nova prévia). Revista Medico-Cirurgica do Brasil 40:345-346.

———. 1934. Sôbre duas especies de Anoplura encontradas em ratos sylvestres do Brazil. Memórias do Instituto Oswaldo Cruz 27:407-415.

———. 1937. Algumas especies e subespecies novas de Anoplura. Memórias de Instituto Oswaldo Cruz 32:391-410, plates 1-3.

———. 1942. "Pterophthirus imitans" n. sp. (Anoplura, Haematopinidae). Revista Brasiliera di Biologica 2:317-320.

———. 1948*a*. Notas sôbre o gènero *Enderleinellus*. Memórias do Instituto Oswaldo Cruz 45:281-305, Plate 1.

———. 1948*b*. "Neohaematopinus longus" n. sp. (Anoplura, Haematopinidae). Revista Brasiliera di Biologia 8:173-175.

———. 1952. Contribuição ao cohecimento dos Anopluros. I. Revista Brasiliera di Biologica 12:69-78.

——— 1954. Contribuição ao conhecimento dos Anopluros. V. Revista Brasiliera di Biologica 14:109-117.

S-NA-PROVO
[illegible] 3-21-73

Brigham Young University
Science Bulletin

MUS. COMP. ZOOL.
LIBRARY

MAR 30 1973

HARVARD
UNIVERSITY

FLEAS OF VENEZUELA

by

Vernon J. Tipton

and

Carlos E. Machado-Allison

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 6
SEPTEMBER 1972

BRIGHAM YOUNG UNIVERSITY SCIENCE BULLETIN

BIOLOGICAL SERIES

Editor: Stanley L. Welsh, Department of Botany,
Brigham Young University, Provo, Utah

Members of the Editorial Board:

Vernon J. Tipton, Zoology
Ferron L. Andersen, Zoology
Joseph R. Murdock, Botany
Wilmer W. Tanner, Zoology

Ex officio Members:
A. Lester Allen, Dean, College of Biological and Agricultural Sciences
Ernest L. Olson, Chairman, University Publications

The Brigham Young University Science Bulletin, Biological Series, publishes acceptable papers, particularly large manuscripts, on all phases of biology.

Separate numbers and back volumes can be purchased from Publication Sales, Brigham Young University, Provo, Utah. All remittances should be made payable to Brigham Young University.

Orders and materials for library exchange should be directed to the Division of Gifts and Exchange, Brigham Young University Library, Provo, Utah 84601.

Brigham Young University
Science Bulletin

FLEAS OF VENEZUELA

by

Vernon J. Tipton

and

Carlos E. Machado-Allison

BIOLOGICAL SERIES — VOLUME XVII, NUMBER 6
SEPTEMBER 1972

TABLE OF CONTENTS

ABSTRACT 1

INTRODUCTION 1

FLEA SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTIONS 2

- Family Pulicidae 2
  - Genus *Pulex* Linnaeus, 1758 2
    - *Pulex irritans* Linnaeus, 1758 2
    - *Pulex simulans* Baker, 1895 2
  - Genus *Echidnophaga* Olliff, 1886 3
    - *Echidnophaga gallinacea* (Westwood, 1875) 3
  - Genus *Ctenocephalides* Stiles and Collins, 1930 3
    - *Ctenocephalides canis* (Curtis, 1826) 3
    - *Ctenocephalides felis felis* (Bouche, 1835) 3
  - Genus *Xenopsylla* Glinkiewicz, 1907 3
    - *Xenopsylla brasiliensis* (Baker, 1904) 4
    - *Xenopsylla cheopis* (Rothschild, 1903) 4
  - Genus *Hectopsylla* Frauenfeld, 1860 4
    - *Hectopsylla psittaci* Frauenfeld, 1860 4
  - Genus *Rhynchopsyllus* Haller, 1880 4
    - *Rhynchopsylla pulex* Haller, 1880 4
  - Genus *Tunga* Jarocki, 1838 5
    - *Tunga penetrans* (Linnaeus, 1758) 5
- Family Rhopalopsyllidae 5
  - Genus *Rhopalopsyllus* Baker, 1905 5
    - *Rhopalopsyllus australis australis* (Rothschild, 1904) 5
    - *Rhopalopsyllus cacicus saevus* Jordan and Rothschild, 1908 5
    - *Rhopalopsyllus lugubris lugubris* Jordan and Rothschild, 1908 10
    - *Rhopalopsyllus lutzi cleophontis* (Rothschild, 1904) 10
  - Genus *Polygenis* Jordan, 1939 10
    - *Polygenis atopus* (Jordan and Rothschild, 1922) 10
    - *Polygenis bohlsi bohlsi* (Wagner, 1901) 15
    - *Polygenis dunni* (Jordan and Rothschild, 1922) 15
    - *Polygenis frustratus* Johnson, 1957 20
    - *Polygenis impavidus* Johnson, 1957 20
    - *Polygenis klagesi klagesi* (Rothschild, 1904) 23
    - *Polygenis klagesi samuelis* (Jordan and Rothschild, 1923) 23
    - *Polygenis occidentalis steganus* (Jordan and Rothschild, 1923) 28
    - *Polygenis peronis* (Jordan and Rothschild, 1923) 28
    - *Polygenis roberti beebei* (I. Fox, 1947) 28
    - *Polygenis versuta* Guimarães, 1942 35
- Family Pygiopsyllidae 35
  - Genus *Ctenidiosomus* Jordan, 1931 35
    - *Ctenidiosomus perplexus*, new species 41
- Family Hystrichopsyllidae 45
  - Genus *Adoratopsylla* Ewing, 1925 45
    - *Adoratopsylla* (*Adoratopsylla*) *antiquorum antiquorum* (Rothschild, 1904) 45
    - *Adoratopsylla* (*Adoratopsylla*) *antiquorum discreta* (Jordan, 1926) 46
    - *Adoratopsylla* (*Adoratopsylla*) *antiquorum rara*, new subspecies 46
    - *Adoratopsylla* (*Adoratopsylla*) *antiquorum recta*, new subspecies 46
    - *Adoratopsylla* (*Adoratopsylla*) *bisetosa* Ewing, 1925 56
    - *Adoratopsylla* (*Adoratopsylla*) *dilecta* Jordan, 1938 56
    - *Adoratopsylla* (*Tritopsylla*) *intermedia intermedia* (Wagner, 1901) 60
  - Genus *Neotyphloceras* Rothschild, 1914 64
    - *Neotyphloceras rosenbergi* (Rothschild, 1904) 64
- Family Stephanocircidae 72
  - Genus *Cleopsylla* Rothschild, 1914 72

- *Cleopsylla monticola* Smit, 1953 ... 72
- Genus *Craneopsylla* Rothschild, 1911 ... 75
  - *Craneopsylla minerva minerva* (Rothschild, 1903) ... 75
- Genus *Plocopsylla* Jordan, 1931 ... 75
  - *Plocopsylla ulysses* Hopkins, 1951 ... 75
- Genus *Sphinctopsylla* Jordan, 1931 ... 83
  - *Sphinctopsylla tolmera* (Jordan, 1931) ... 83

Family Ischnopsyllidae ... 87
- Genus *Hormopsylla* Jordan and Rothschild, 1921 ... 87
  - *Hormopsylla cryptica*, new species ... 87
- Genus *Myodopsylla* Jordan and Rothschild, 1911 ... 91
  - *Myodopsylla wolffsohni salvasis* Jordan, 1931 ... 91
- Genus *Ptilopsylla* Jordan and Rothschild, 1921 ... 91
  - *Ptilopsylla leptina* Jordan and Rothschild, 1921 ... 91
- Genus *Rothschildopsylla* Guimarães, 1953 ... 91
  - *Rothschildopsylla noctilionis* (Costa Lima, 1920) ... 91
- Genus *Sternopsylla* Jordan and Rothschild, 1921 ... 99
  - *Sternopsylla distincta speciosa* Johnson, 1957 ... 99

Family Ceratophyllidae ... 104
- Genus *Dasypsyllus* Baker, 1905 ... 104
  - *Dasypsyllus gallinulae perpinnatus* (Baker, 1904) ... 104
  - *Dasypsyllus lasius venezuelensis* (Fox and Anduze, 1947) ... 104
  - *Dasypsyllus stejnegeri* (Jordan, 1929) ... 104
- Genus *Orchopeas* Jordan, 1933 ... 104
  - *Orchopeas howardi* Baker, 1895 ... 104
- Genus *Pleochaetis* Jordan, 1933 ... 105
  - *Pleochaetis appolinaris* (Jordan and Rothschild, 1921) ... 105
  - *Pleochaetis dolens* (Jordan and Rothschild, 1914) ... 105
  - *Pleochaetis dolens quitanus* (Jordan, 1931) ... 105
  - *Pleochaetis smiti* Johnson, 1954 ... 109

Family Leptopsyllidae ... 112
- Genus *Leptopsylla* Jordan and Rothschild, 1911 ... 112
  - *Leptopsylla segnis* (Schönherr, 1811) ... 112

LITERATURE CITED ... 112

FLEAS OF VENEZUELA

by

Vernon J. Tipton[1]

and

Carlos E. Machado-Allison[2]

ABSTRACT

Forty-three species of fleas were collected in Venezuela by personnel of the Smithsonian Venezuelan Project. Currently there are fifty-two species of fleas known from Venezuela. Four new taxa are described: *Hormopsylla cryptica, Ctenidiosomus perplexus, Adoratopsylla antiquorum rara* and *Adoratopsylla antiquorum recta.* The females of *Adoratopsylla antiquorum discreta* Jordan and *Rothschildopsylla noctilionis* (Costa Lima) are described. The families Stephanocircidae (*Cleopsylla, Craneopsylla, Plocopsylla, Sphinctopsylla*) and Pygiopsyllidae (*Ctenidiosomus*) are reported from Venezuela for the first time. Two male specimens of the genus *Orchopeas* constitute the first record of this genus in South America and records of species of the genus *Pleochaetis* are the first reported for Venezuela. Illustrations are provided to facilitate identification of Venezuelan fleas.

INTRODUCTION

Venezuela, a country of great fascination to zoologists, is geographically located so that elements of the Amazonian, Andean, and Middle American faunae are represented. The rhopalopsyllid genera *Rhopalopsyllus* Baker and *Polygenis* Jordan and the hystrichopsyllid genus *Adoratopsylla* Ewing are characteristic of the Amazonian flea fauna. The Andean flea fauna, virtually unknown heretofore in Venezuela, is represented by the stephanocircid genera *Cleopsylla* Rothschild, *Craneopsylla* Rothschild, *Plocopsylla* Jordan and *Sphinctopsylla* Jordan, the pygiopsyllid genus *Ctenidiosomus* Jordan and the hystrichopsyllid genus *Neotyphloceras* Rothschild. The Middle American fauna, also poorly known in Venezuela, is contained primarily in two ceratophyllid genera, *Pleochaetis* Jordan and *Orchopeas* Jordan.

Papers published to date have dealt principally with the Amazonian flea fauna in Venezuela. Anduze, et al. (1947) listed 21 species and subspecies, and the list was subsequently enlarged to include 29 species and subspecies by Cova Garcia and Tallaferro (1959). Machado-Allison (1966) recorded 30 species and subspecies, and his list is essentially the same as that provided by Barrera and Diaz-Ungria (1957).

During a three year period from July 1965 to September 1968, approximately forty thousand mammals were collected in Venezuela by personnel associated with the Smithsonian Venezuelan Project (SVP), who had the support and cooperation of several individuals and agencies in Venezuela. Most of the mammals were examined for ectoparasites. This paper is based on 43 species and subspecies of fleas collected from the host animals by SVP. With species previously listed but not collected by SVP the number of species and subspecies known from Venezuela is raised to 52. However, a definitive study of the fleas of Venezuela still is not feasible even though the SVP collection is rather extensive both geographically and ecologically. Several genera, particularly *Polygenis* Jordan and *Pleochaetis* Jordan are badly in need of revision. Specific names assigned to some populations in these genera are provisional at best. Large series of specimens from type localities will be required before species can be defined and the limits of subspecific variation determined.

---

[1] Department of Zoology, Brigham Young University, Provo, Utah 84601
[2] Institute of Tropical Zoology, Science Faculty, Central University of Venezuela, Caracas

In addition to reporting species in four genera of the family Stephanocireidae and a species of *Ctenidiosomus* in the family Pygiopsyllidae from Venezuela for the first time, we also report the initial finding of a species of the genus *Orchopeas* in South America. We have described two new species, two new subspecies, and the females of *Adoratopsylla antiquorum discreta* Jordan and *Rothschildopsylla noctilionis* (Costa Lima).

We express appreciation to Dr. Robert Traub for his assistance in dealing with taxonomic problems in the genus *Pleochaetis*. Mr. F.G.A.M. Smit studied several populations in the genus *Polygenis* and rendered opinions which were helpful. He looked at specimens in other genera as well, and we are most grateful for his help. Thanks are due to Dr. Charles O. Handley, Jr., for identification of the host animals. Jeanne Thomas, Michael W. Hastriter, Lynden P. Baum, Peggy Card, and Toni Marriette have been most helpful in the preparation of the manuscript. Lt. Colonel Alexander A. Hubert and the group of artists at the 406th Medical Laboratory, Japan, have been most generous with their assistance; all of the illustrations were prepared by this exceptional group of artists.

This publication is a contribution of the Smithsonian Venezuelan Project, supported by a contract (DA-49-193-MD-2788) of the Medical Research and Development Command, Office of the Surgeon General, U. S. Army.

FLEA SPECIES IN THE SMITHSONIAN VENEZUELAN COLLECTIONS

Family Pulicidae

Genus *Pulex* Linnaeus

Pulex Linnaeus, 1758:614.

Type Species: *Pulex irritans* Linnaeus, 1758.

Pulex irritans Linnaeus

Pulex irritans Linnaeus, 1758:614.—Vogelsang, 1939:168-172. — Hecht, 1943:1159-1162. — Anduze and Vogelsang, 1949:1-4.—Hopkins and Rothschild, 1953:105-118. — Johnson, 1957:231, Pl. 106, 107.—Barrera and Diaz-Ungria, 1957:166.—Machado-Allison, 1963: 275.—1966:24.

Remarks

We did not collect *P. irritans* in Venezuela. Records published by Hopkins and Rothschild (1953) ex *Tamandua* sp. and Barrera and Diaz-Ungria (1957) ex *Cerdocyon thous thous* likely represent the same species we have identified as *P. simulans*. (For further discussion see *P. simulans*).

Pulex simulans Baker

Pulex simulans Baker, 1895:65, 67.—Smit, 1958: 523-526, Fig. 1.—Tipton and Mendez, 1966: 293, Pl. 48, Fig. 4, Pl. 51, Fig. 6, 7.—1968: 178-179.

Type Data: At least 1 male and 2 females ex *Didelphis marsupialis* (= *D. virginiana*), probably Devil's River, Texas, F. M. Webster collector. Smit (1958) has designated a syntype in the Tring collection as lectotype inasmuch as the male type specimen has been lost.

Other Recorded Distribution: USA: ex *Didelphis marsupials* (= *D. virginiana*) and *Cynomys mexicanus*. Mexico: ex *Cynomys mexicanus*. Panama: ex *Homo sapiens*.

Venezuelan Records (114 males and 193 females)

Seventy-six males and 126 females ex 14 *Tamandua longicaudata* in Falcón, Lara, Monagas, and Carabobo. Other collection records include: 14 males and 27 females ex 10 *Cerdocyon thous* from Trujillo, Monagas, Falcón, and Lara; 7 males and 13 females ex 7 *Conepatus semistriatus* from Monagas and Falcón; 5 males and 3 females ex 3 *Didelphis marsupialis* from Miranda, Monagas, and Lara. Additional hosts include: *Procyon cancrivorus* (Guárico), *Metachirus nudicaudatus* (Barinas), *Galictis vittata* (Monagas), *Proechimys semispinosus* (Lara), *Echimys semivillosus* (Lara), *Urocyon cinereoargenteus* (Lara), *Zygodontomys brevicauda* (Lara), *Glossophaga soricina*[3] (Falcón), and three unidentified hosts.

Remarks

The aedeagal crochet in our specimens resembles figures given by Smit (1958) but is somewhat more swollen. The dorsal aedeagal sclerite is narrower than that shown by Smit for *P. simulans* and appears to be intermediate between *P. simulans* and *P. irritans*. The median dorsal lobe of the aedeagus is unlike *P. simulans* or *P. irritans*. The apex of the finger of the clasper is truncate, not rounded as in *P. irritans*.

The Venezuelan specimens are very much like material from Cerro Potosi, Mexico, and

---

[3] Probably a contamination

Panama. We suspect that the difference between *P. simulans* and *P. irritans* pointed out by Smit (1958) will not stand if long series from several localities are studied.

Fifteen of our 45 collections are from *Tamandua longicaudata* and 202 (65.8%) of the 307 fleas collected were from this host. The flea index on *Tamandua longicaudata* is 13.5 compared with 4.0 on *Cerdocyon thous* and 2.8 on *Conepatus semistriatus.*

Genus *Echidnophaga* Olliff

Echidnophaga Olliff, 1886:171.

Type Species: *Echidnophaga ambulans* Olliff, 1886.

Echidnophaga gallinacea (Westwood)

Sarcopsyllus gallinaceus Westwood, 1875:246.

Echidnophaga gallinaceus, Jordan and Rothschild, 1906:52, Pl. 1, Fig. 1; Pl. 2, Fig. 14; Pl. 3, Fig. 21; Pl. 4, Fig. 27.

Echidnophaga gallinacea, Patton and Evans, 1929:539, Fig. 287.—Hopkins and Rothschild, 1953:88-95, Fig. 93, 109-113; Pl. 14A, 15A, 17B.—Johnson, 1957:232, Pl. 108, 109.— Barrera and Diaz-Ungria, 1957:168.—Machado-Allison, 1963:275.—1966:24.

REMARKS

We did not collect *E. gallinacea* but other workers have recorded it from Venezuela.

Genus *Ctenocephalides* Stiles and Collins

Ctenocephalides Stiles and Collins, 1930:1308.

Type Species: *Pulex canis* Curtis, 1826.

Ctenocephalides canis (Curtis)

Pulex canis Curtis, 1826:114, Fig. A-E, 8.

Ctenicephalus canis, Rothschild, 1915:56, 91 Pl. 7, Fig. 4, 10.

Ctenocephalides canis, I. Fox, 1940:26, Pl. 6, Fig. 24, 26, 27.—Hecht, 1942:811-820.—Hopkins and Rothschild, 1953:164-170, Fig. 74A, 154, 156, 158-60; Pl. 5A, 24C, D, 27C.—Johnson, 1957:227-229.—Barrera and Diaz-Ungria, 1957:168.—Machado-Allison, 1963:275.—1966:24.

REMARKS

Although we collected 154 specimens of *C. felis felis* we did not encounter *C. canis.* Barrera and Diaz-Ungria (1957) and Machado-Allison (1963) indicate that this species has been collected in Venezuela.

Ctenocephalides felis felis (Bouche)

Pulex felis Bouche, 1835:505, Fig. 2.

Ctenocephalides felis felis, Hecht, 1942:811-820.—Hopkins and Rothschild, 1953:145, Fig. 14, 152, 155, 157, 161, 162, Pl. 25E, 27A, B, D.—Johnson, 1957:228, Pl. 100, 101.—Barrera and Diaz-Ungria, 1957:161, 163, 170, Lam. II, Fig. 1.—Cova Garcia and Tallaferro, 1959:328, 331, 340, 346.—Machado-Allison, 1963:275.—1966:24. — Tipton and Mendez, 1966:293, Pl. 47.

Type Data: ex "hauskatze"; Germany.

Other Recorded Distribution: *C. felis* is cosmopolitan and has been reported from most countries in South America including: Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Surinam, and Uruguay. In Venezuela it has been collected from "rat," man, dog, *Rattus rattus* (*R. r. alexandrinus, R. r. frugivorus, R. r. rattus*), *R. norvegicus, Cerdocyon thous thous* and "*Felis cati dom*" (= *F. catus*).

VENEZUELAN RECORDS (50 males and 104 females)

Most specimens were collected ex 10 *Cerdocyon thous* (18 males and 49 females) in T. F. Amazonas, Trujillo, Apure, Lara and Zulia; ex 13 *Didelphis marsupialis* (13 males and 24 females) in T. F. Amazonas, Lara, Barinas, Monagas, Bolívar, Sucre, Trujillo, and Dto. Federal. Other hosts include: *Zygodontomys brevicauda* (T. F. Amazonas and Sucre), *Sigmodon hispidus* (Carabobo), *Rattus rattus* (Dto. Federal), *Heteromys anomalus* (Dto. Federal), *Agouti paca* (Zulia), *Cyclopes didactylus* (T. F. Amazonas), *Sciurus igniventris* (Bolívar), *Monodelphis brevicaudata* (Carabobo), *Felis pardalis* (Bolívar), *Tapirus terrestris*[4] (Apure), *Cebus albifrons* (Zulia), *Homo sapiens* (Bolivar, and T. F. Amazonas), and *Carollia perspicillata*[3] (Falcón).

REMARKS

Of the total 154 specimens of *C. felis felis* collected, 67 (43.5%) were associated with *Cerdocyon thous* (Flea index 6.1) and 34 (22.1%) on *Didelphis marsupialis* (flea index 2.6). Johnson (1957) did not give a subspecific designation for South American populations but our specimens appear to be the nominate subspecies.

Genus *Xenopsylla* Glinkiewicz

Xenopsylla Glinkiewicz, 1907:385.

Type Species: *Xenopsylla pachyuromyidis* Glinkiewicz, 1907.

---

[4] Field identification only

Xenopsylla brasiliensis (Baker)

Pulex brasiliensis Baker, 1904:378, 379, 435.

Xenopsylla brasiliensis, Rothschild, 1909:332.—Hecht, 1942:811-820.—Hopkins and Rothschild, 1953:295-300, Fig. 250, 253, 296, 348, 360, 361; Pl. 42B, D, F.—Johnson, 1957:226, Pl. 98, Fig. 2, 7; Pl. 99, Fig. 2, 6.—Barrera and Diaz-Ungria, 1957:171. — Machado-Allison, 1963:275.—1966:24.

REMARKS

X. brasiliensis, an important vector of plague in Venezuela, occurs on *Rattus norvegicus* in urban areas. We did not collect this species in Venezuela.

Xenopsylla cheopis (Rothschild)

Pulex cheopis Rothschild, 1903*a*:85, Pl. 1, Fig. 3, 9; Pl. 2, Fig. 12, 19.

Xenopsylla pachyuromyidis Glinkiewicz, 1907: 385, Pl. 2, Fig. 1-4.

Xenopsylla cheopis, Rothschild, 1910:92, Fig. 9, 11.—Anduze, Vogelsang, and Pifano, 1947: 4.—Jordan, 1950:599.—Traub, 1950:89, 109, 112, Pl. 53, Fig. 1.—Hopkins and Rothschild, 1953:248-260, Fig. 20A, 76, 199, 220, 246, 255, 259, 266, 286, 305-308, 310, 391; Pl. 2, 22D-F, 39A, 40E.—Johnson, 1957:225-227, Pl. 98, Fig. 1, 3, 4, 5, 8; Pl. 2, Fig. 12, 19.—Barrera and Diaz-Ungria, 1957:163, 170, 171, Lam. 11, Fig. 2.—Cova Garcia and Tallaferro, 1959:328, 331, 340, 347.—Machado-Allison, 1963:275.—1966:24, 30-32, Fig. 10.—Tipton and Mendez, 1966:294, 295, Pl. 52, 53.

Type Data: Holotype male ex *Acomys witherbyi*, Sudan: near Shendi, 5-III-1901, N. C. Rothschild and A.F.R. Wollaston, collectors

Other Recorded Distribution: Cosmopolitan.

VENEZUELAN RECORDS (4 males and 1 female)

Three specimens were collected from *Rattus rattus* (Dto. Federal and Monagas) and the remaining 2 specimens were collected from *Oryzomys albigularis* (Dto. Federal) and *Sigmodon hispidus* (Carabobo).

REMARKS

Barrera and Diaz-Ungria (1957) have published records of *X. cheopis* from Caracas ex *Rattus rattus* (*R. r. alexandrinus* and *R. r. rattus*), *R. norvegicus* and in the state of Aragua ex "ratas de Campo." During a three year collecting period (1965-1968) more than 102 specimens of the genus *Rattus* were collected from which only 3 specimens of *X. cheopis* were taken, indicating that the widespread use of insecticides may have reduced the population of this flea.

Genus *Hectopsylla* Frauenfeld

Hectopsylla Frauenfeld, 1860:464.

Type Species: *Hectopsylla psittaci* Frauenfeld.

Hectopsylla psittaci Frauenfeld

Hectopsylla psittaci Frauenfeld, 1860:464.—Vogelsang, 1939:168-172. — Hopkins and Rothschild, 1953:52-53, Fig. 40, 41.—Johnson, 1957:236, Pl. 110, 111, Fig. 2.—Barrera and Diaz-Ungria, 1957:174. — Machado-Allison, 1963:275.—1966:24.

REMARKS

H. psittaci is a parasite of birds, and since our major effort was directed toward collecting ectoparasites of mammals it is not surprising that we did not collect it.

Genus *Rhynchopsyllus* Haller

Rhynchopsyllus Haller, 1880:72.

Type Species: *Rhynchopsyllus pulex* Haller.

Rhynchopsyllus pulex Haller
(Fig. 1)

Rhynchopsyllus pulex Haller, 1880:82, Pl. 6, Fig. 1-13.—Traub and Gammons, 1950:271, Fig. 6, 7.—Johnson, 1957:237-238, Pl. 112, Fig. 3, 5.—Barrera and Diaz-Ungria, 1957: 170.—Machado-Allison, 1963:271, 272, 275.—1966:24.—Tipton and Mendez, 1966:296.

Type Data: Descriptions based on females ex *Molossus* species, Brazil.

Other Recorded Distribution. Argentina: ex *Zonotrichia pileata*, *Myotis nigricans* and

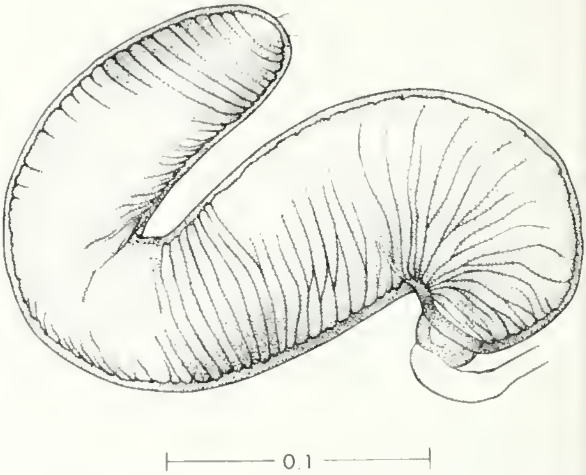


Fig. 1. *Rhynchopsyllus pulex* Haller. Female: spermatheca.

Nyctinomus brasiliensis (= *Tadarida brasiliensis*). Bolivia: ex *Molossus obscurus*. Brazil: ex *Histiotus velatus*, *Nyctinomus macrotis* (= *Tadarida macrotis*), *Molossus obscurus*, and *Eumops perotis*. Chile: ex *Nyctinomus brasiliensis* (= *Tadarida brasiliensis*). Colombia: ex *Molossus obscurus*. Ecuador: ex *Rhipidomys leucodactylus* and "bat." Peru: ex *Molossus obscurus* and *Histiotus* species. Venezuela: ex *Vespertilio fuscus* (= *Eptesicus fuscus*) and *Myotis nigricans*.

Venezuelan Records (3 females)

Our material consists of three females ex *Molossus major* (SVP 4665 and SVP 4713), Dto. Federal, El Limón, about 400 m. elev., 19, 20-VIII-1966.

Remarks

Although based on meager evidence, it appears that *R. pulex* is associated with molossid bats at low elevations.

Genus *Tunga* Jarocki

Tunga Jarocki, 1838:50.

Type Species: *Pulex penetrans* (Linnaeus).

Tunga penetrans (Linnaeus)

Pulex penetrans Linnaeus, 1758:614.

Tunga penetrans, Jarocki, 1838:50, Fig. 10-13.—Vogelsang, 1948:145-151. – Hopkins and Rothschild, 1953:39-43, Fig. 21, 22A, 23, 26A, 28, 37; Pl. 6A, B, 7A-C, 8B.—Johnson, 1957:240, Pl. 113, 114.—Barrera and Diaz-Ungria, 1957:172. – Machado-Allison, 1963: 275.—1966:24.—Tipton and Mendez, 1966: 295, Pl. 48, Fig. 1; Pl. 49, Fig. 1, 2.

Remarks

Barrera and Diaz-Ungria (1957) record *T. penetrans* from *Sus scrofa*, *Bos taurus*, *Myrmecophaga tridactyla*, and *Homo sapiens*. We did not collect this species.

Family Rhopalopsyllidae

Genus *Rhopalopsyllus* Baker

Rhopalopsyllus Baker, 1905:128, 129, 143.

Type Species: *Pulex lutzi* Baker.

Rhopalopsyllus australis australis (Rothschild)
(Fig. 2, 3)

Pulex australis Rothschild, 1904:613, Pl. 9, Fig. 29, Pl. 10, Fig. 34, 36.

Rhopalopsyllus australis, Jordan and Rothschild, 1908:71, Pl. 3, Fig. 11; Pl. 4, Fig. 10, 11.

Rhopalopsyllus australis australis, Jordan and Rothschild, 1923*b*:327, Fig 338.—Ewing and Fox, 1943:21. – Guimarães, 1940:235-236.—Anduze, Vogelsang, and Pifano, 1947:4.—Costa Lima and Hathaway, 1946:140.—Traub and Johnson, 1952:131.—Johnson, 1957:175.—Barrera and Diaz-Ungria, 1957:164, 182.—Cova Garcia and Tallaferro, 1959:331, 347.—Machado-Allison, 1962*b*:188. – 1966:26, 35, Fig. 12.

Type Data: Type material consists of 3 males and 13 females ex *Dicotyles labiatus* (=*Tayassu pecari*), Mexico: Santa Andréa, Tabasco, 30-V-1897.

Other Recorded Distribution: Mexico: ex *Tamandua tetradactyla*. Panama: ex *Tamandua tetradactyla chiriquensis*. Trinidad: ex *Agouti paca*, *Didelphis marsupialis*, and deer. Venezuela: ex *Didelphis marsupialis*, and *Akodon urichi*.

Venezuelan Records (82 males and 143 females)

There were 17 males and 23 females ex 6 *Dasyprocta aguti* from Bolívar, Carabobo, and the border between Falcón and Yaracuy; 7 males and 16 females ex 10 *Didelphis marsupialis* from Bolivar, Falcón, Miranda, Monagas, Yaracuy, and Zulia; 8 males and 12 females ex 3 *Tayassu tajacu* from Apure, Barinas, and Bolivar; 2 males and 8 females ex 5 *Tayassu pecari* from Bolívar; 7 males and 24 females ex 4 *Tamandua longicaudata* from T. F. Amazonas, Apure, Monagas, and Zulia; 1 male and 4 females ex 3 *Tamandua tetradactyla* from Monagas and Zulia; 5 males and 4 females ex 2 *Myoprocta pratti* from T. F. Amazonas; 2 males and 5 females ex 5 *Cerdocyon thous* from Bolívar, Monagas, and Trujillo; 2 males and 5 females ex 3 *Conepatus semistriatus* from Monagas, Zulia, and the border between Carabobo and Yaracuy; and 4 males and 21 females ex 3 *Mazama americana* from Apure and Bolivar. Other hosts include: *Proechimys semispinosus* (Trujillo and Zulia); *Proechimys guyannensis* (Bolívar); *Agouti paca* (Bolívar and Zulia); *Dasyprocta fuliginosa* (T. F. Amazonas); *Dasyprocta* sp. (Apure); *Procyon cancrivorus* (Zulia and Táchira); *Eira barbara* (Barinas); *Galictis vittata* (Monagas); *Felis pardalis* (Bolívar and Zulia); *Homo sapiens* (Bolívar); *Artibeus jamaicensis*[3] (Monagas); *Carollia perspicillata*[3] (Falcón); and *Desmodus rotundus*[3] (Monagas).

Remarks

R. australis australis was collected from many hosts representing several families, indicating a broad ecological tolerance. More particularly it was collected from hystricomorph rodents (Dasyproctidae), edentates, marsupials, carnivores, and two genera of Artiodactyla.

Rhopalopsyllus cacicus saevus Jordan and Rothschild
(Fig. 4, 5)

Rhopalopsyllus cacicus Jordan and Rothschild, 1908:73, Pl. 3, Fig. 13, Pl. 4, Fig. 8.

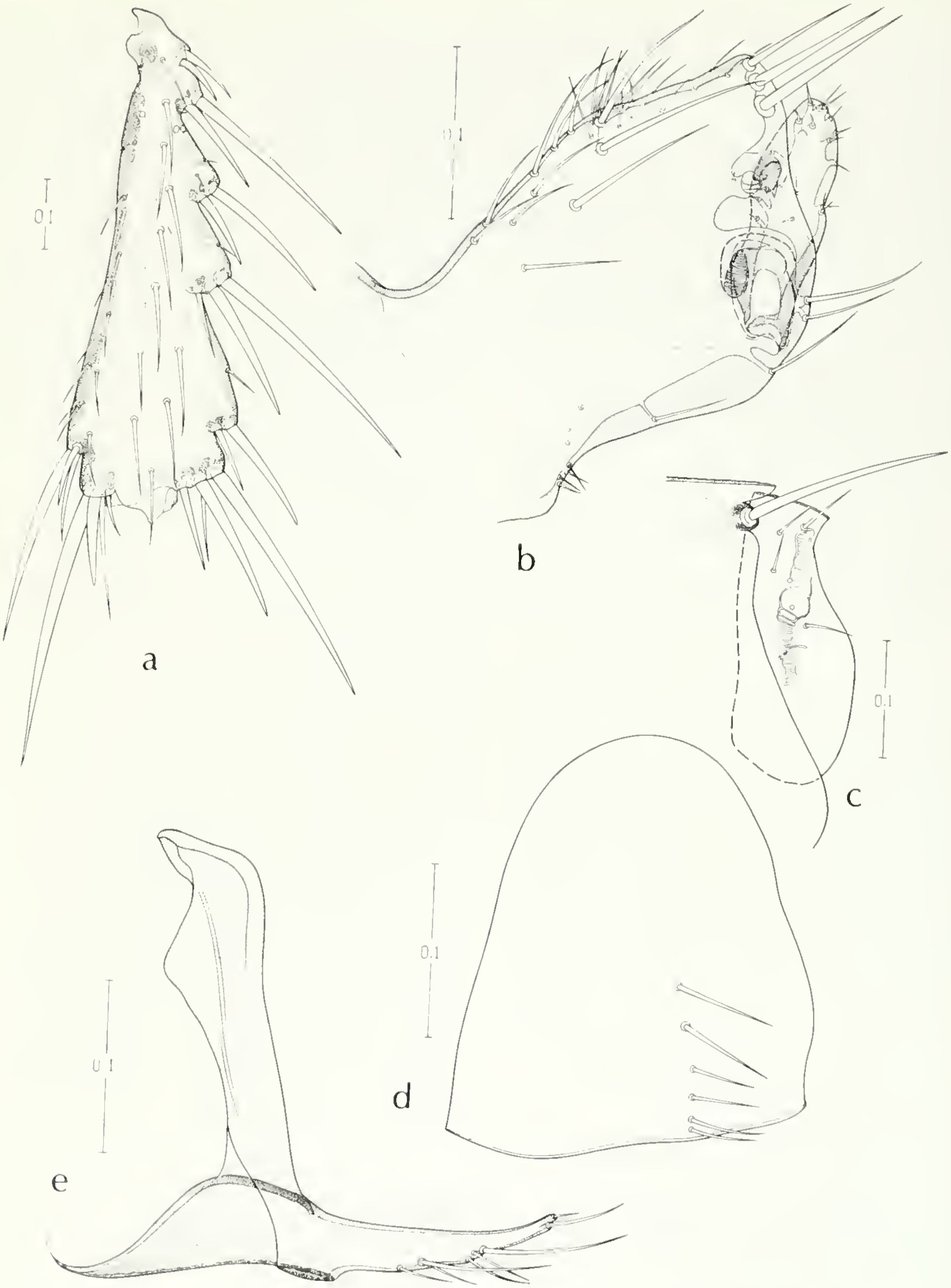


Fig. 2. *Rhopalopsyllus australis australis* (Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

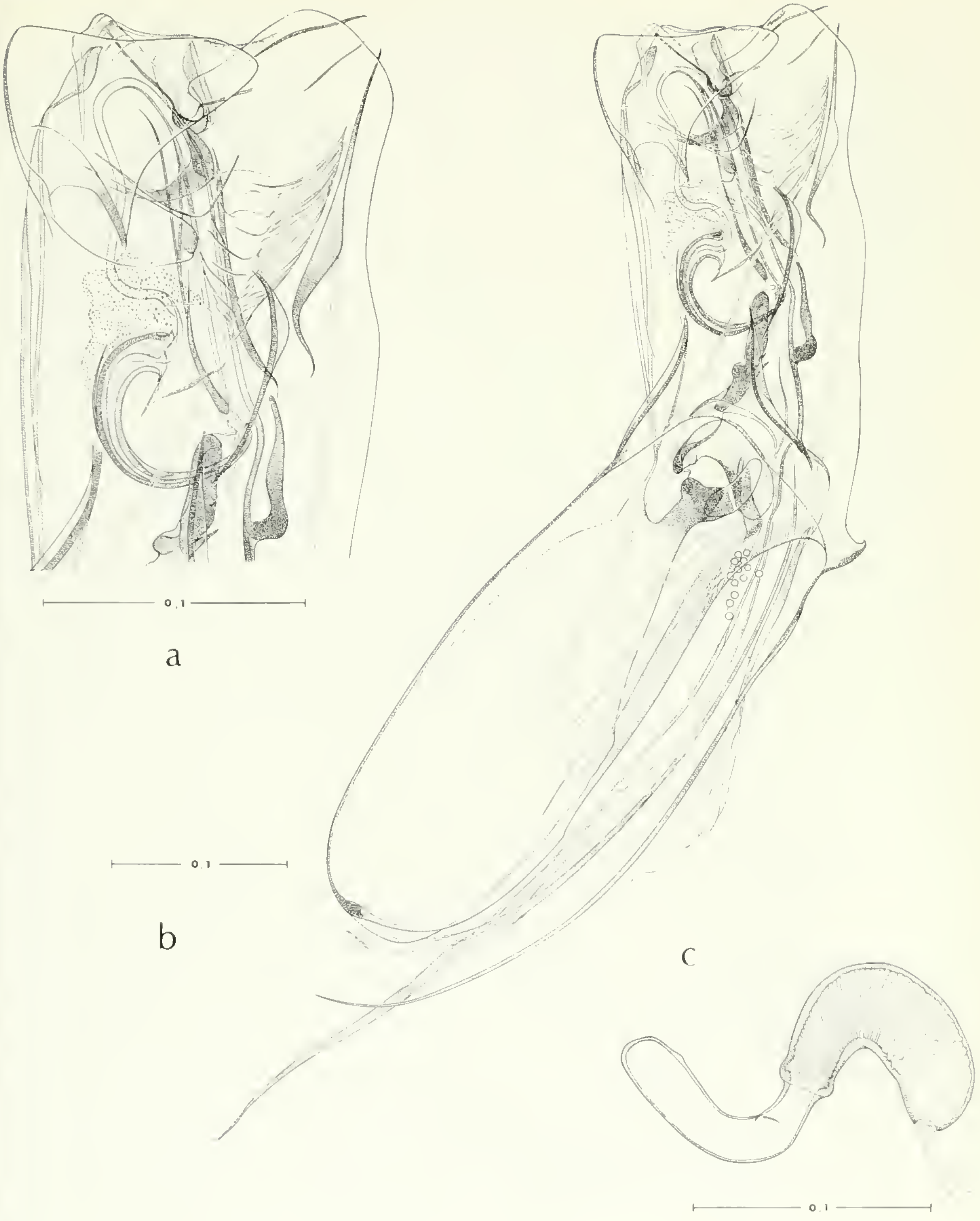


Fig. 3. *Rhopalopsyllus australis australis* (Rothschild). Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.

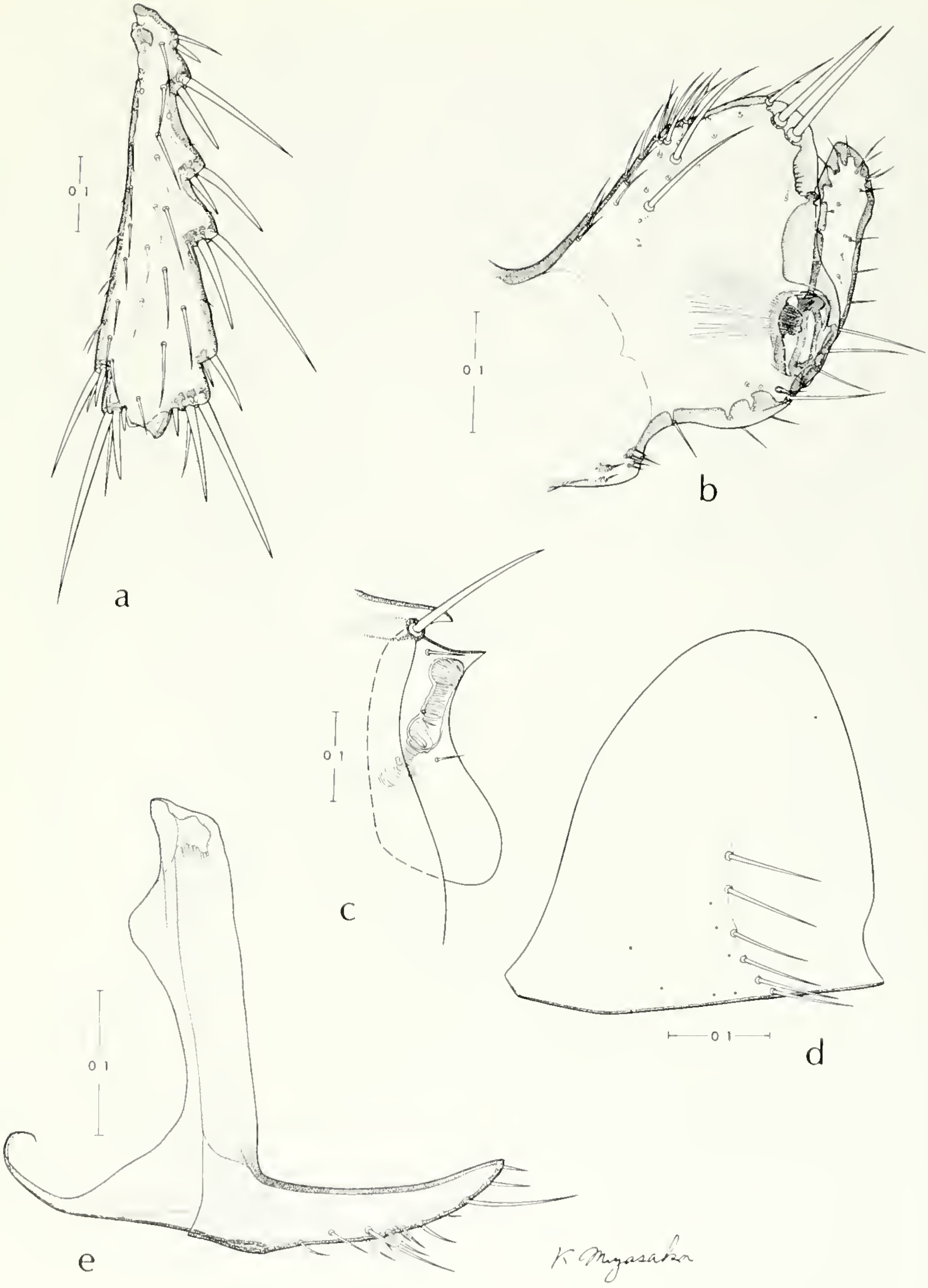

0.1
a
0.1
b
0.1
c
0.1
d
0.1
e
K. Miyasaka

Fig. 4. *Rhopalopsyllus cacicus saevus* Jordan and Rothschild. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

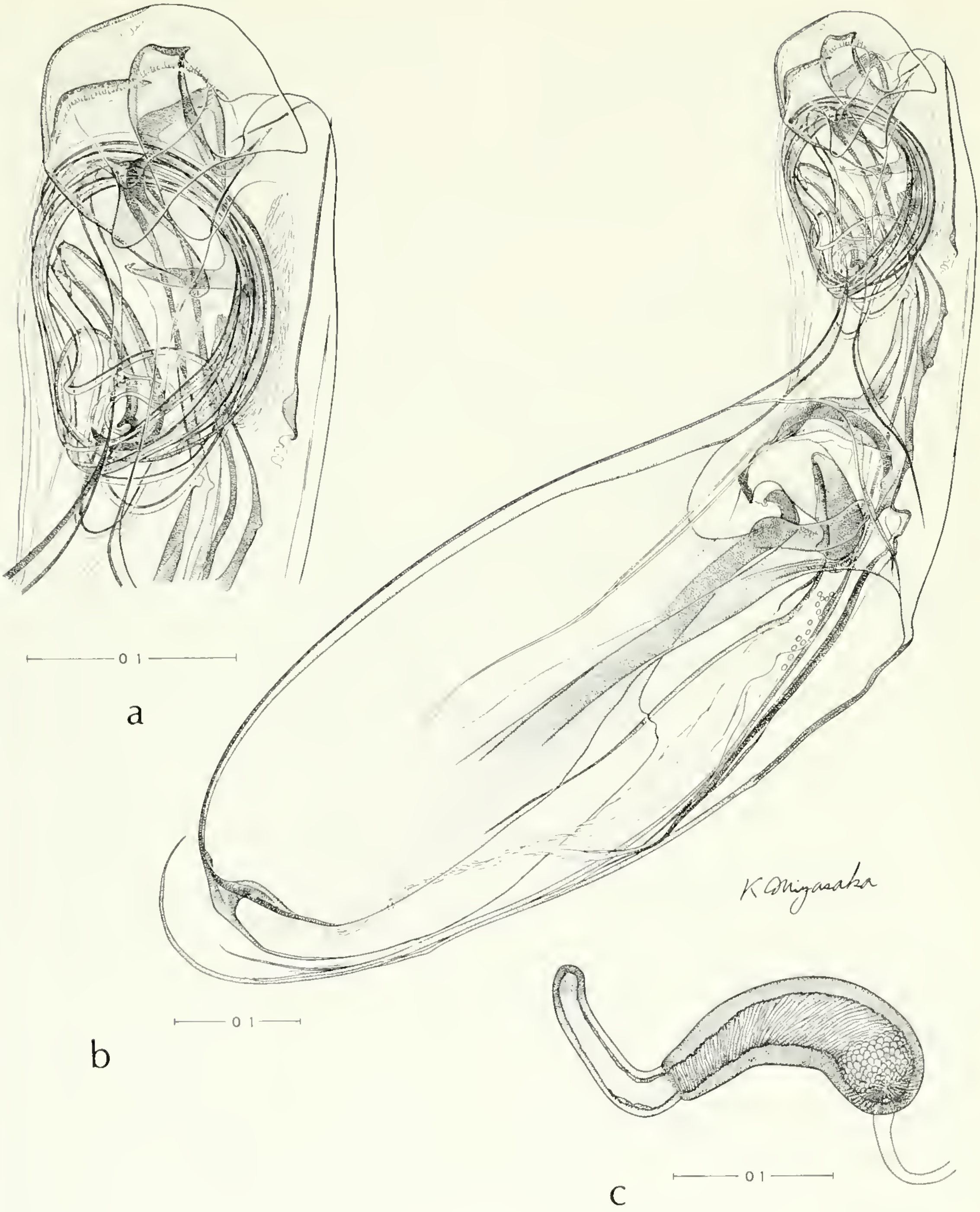

0 1
a
0 1
b
K Miyasaka
0 1
c

Fig. 5. *Rhopalopsyllus cacicus saevus* Jordan and Rothschild. Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.

Rhopalopsyllus cacicus saevus Jordan and Rothschild, 1923*b*:325, Fig. 332.—Jordan, 1939: 445, Fig. 328.—Guimarães, 1940:244.—Ewing and Fox, 1943:21.—Costa Lima and Hathaway, 1946:141.—Traub and Johnson, 1952: 131.—Cova Garcia and Tallaferro, 1959:331, 347.—Johnson, 1957:176.—Barrera and Diaz-Ungria, 1957:164, 183. — Machado-Allison, 1966:26, 32, 35, Fig. 12.—Tipton and Mendez, 1966:301, 303, Pl. 55, Fig. 3; Pl. 59, Fig. 5, 6.

Type Data: Two males, one female ex *Felis pardalis mearnsi*, Panama: La Cabima, L. H. Dunn collector. One male ex *Didelphis marsupialis*, Trinidad: Capara, V-1921, S. M. Klages collector.

Other Recorded Distribution: Colombia: ex *Didelphis marsupialis*. Guatemala: ex *Dasypus novemcinctus mexicanus*. Venezuela: ex *Didelphis m. marsupialis*.

Venezuelan Records (5 males and 1 female)

Four specimens were collected ex 3 *Didelphis marsupialis* in Falcón, Lara, and Yaracuy; 1 male each from *Conepatus semistriatus* in Yaracuy, and *Proechimys semispinosus* in Carabobo.

Remarks

In Panama *R. cacicus saevus* was collected in large numbers from *Dasypus novemcinctus fenestratus* and its burrows near sea level. We suspect that it is not so rare in Venezuela as our records indicate but that we failed to discover its optimum locality and host.

Rhopalopsyllus lugubris lugubris
Jordan and Rothschild
(Fig. 6, 7)

Rhopalopsyllus lugubris Jordan and Rothschild, 1908:74, Pl. 3, Fig. 12; Pl. 6, Fig. 9.—Jordan and Rothschild, 1923*b*:325, 350, Fig. 333, 334c, 336, 337.—Barrera and Diaz-Ungria, 1957:164, 183, 184.

Rhopalopsyllus lugubris lugubris, Johnson, 1957: 177, Pl. 92, Fig. 4; Pl. 93, Fig. 4.—Machado-Allison, 1966:35, Fig. 12.—Tipton and Mendez, 1966:302, Pl. 58, Fig. 2; Pl. 59, Fig. 3, 4.

Type Data: Holotype male ex *Speothos venaticus*, Bolivia: Charuplaya, P. O. Simons collector.

Other Recorded Distribution: Brazil: ex *Coelogenys paca* (= *Agouti paca*). Panama: ex *Didelphis marsupialis caucae*, *Zygodontomys microtinus* (= *Z. brevicauda*), *Proechimys semispinosus panamensis*, *Agouti paca virgatus*, and *Dasyprocta punctata isthmica*. Peru: ex *Didelphis marsupialis*, *Felis* species, and "hamster." Venezuela: ex *Coelogenys paca* (= *Agouti paca*).

Venezuelan Records (82 males and 153 females)

There were 75 males and 131 females ex 16 *Agouti paca* in Bolivar, Falcón, T. F. Amazonas, Apure, and Zulia. An additional 29 specimens were collected from *Mazama americana* (Bolivar), *Didelphis marsupialis* (Monagas and T. F. Amazonas), *Didelphis azarae* (T. F. Amazonas), *Bassaricyon gabbi* (T. F. Amazonas), *Dasyprocta aguti* (Carabobo), and *Proechimys semispinosus* (Zulia).

Over 87% of our specimens were collected from *Agouti paca* and almost 90% were collected at 150 meters elevation or lower. There were 16 specimens of *A. paca* from which we collected 206 fleas (flea index almost 13) while there were 29 fleas collected from the remaining 8 hosts (flea index about 3.6).

Rhopalopsyllus lutzi cleophontis
(Rothschild)

Pulex cleophontis Rothschild, 1904:614, Fig. 32.

Rhopalopsyllus cleophontis, Baker, 1905:130.

Rhopalopsyllus lutzi cleophontis, Jordan and Rothschild, 1923*b*:323, Fig. 329.—Guimarães, 1940:244.—Johnson, 1957:178. — Barrera and Diaz-Ungria, 1957:183. — Machado-Allison, 1963:274, 276.—1966:26.

Remarks

It is surprising that we did not collect *R. lutzi cleophontis* since it is parasitic on *Agouti paca* and *Dasypus novemcinctus*, hosts which we encountered frequently in our collecting.

Genus *Polygenis* Jordan

Polygenis Jordan, 1939:444.

Type Species: *Pulex roberti* Rothschild.

Polygenis atopus (Jordan and Rothschild)
(Fig. 8, 9)

Rhopalopsyllus atopus Jordan and Rothschild, 1922:267, Fig. 259, 260.

Polygenis atopus, Guimarães, 1940:233.—1948: 540, Fig. 1*b*.—Costa Lima and Hathaway, 1946:144.—Johnson, 1957:158, 159.—Machado-Allison, 1962*b*:179.—Tipton and Mendez, 1966:297, 329, Pl. 55.—Del Ponte, 1967:56, 57.

Type Data: Male holotype, two females ex *Didelphis aurita* (= *D. marsupialis aurita*), Brazil: Sta. Catharina, Joinville, Humboldt, 13-X-1913, W. Ehrhardt collector.

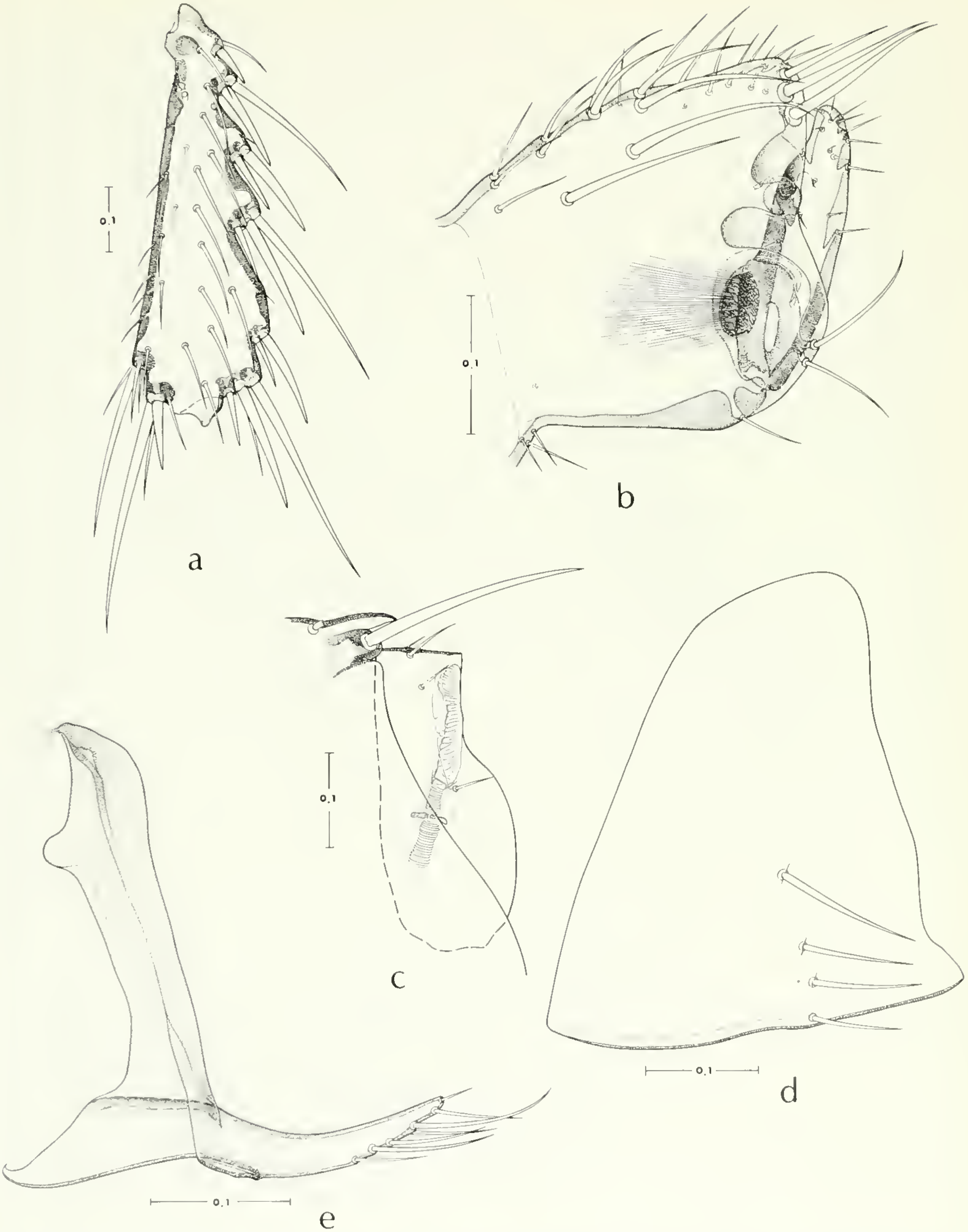


Fig. 6. *Rhopalopsyllus lugubris lugubris* Jordan and Rothschild. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

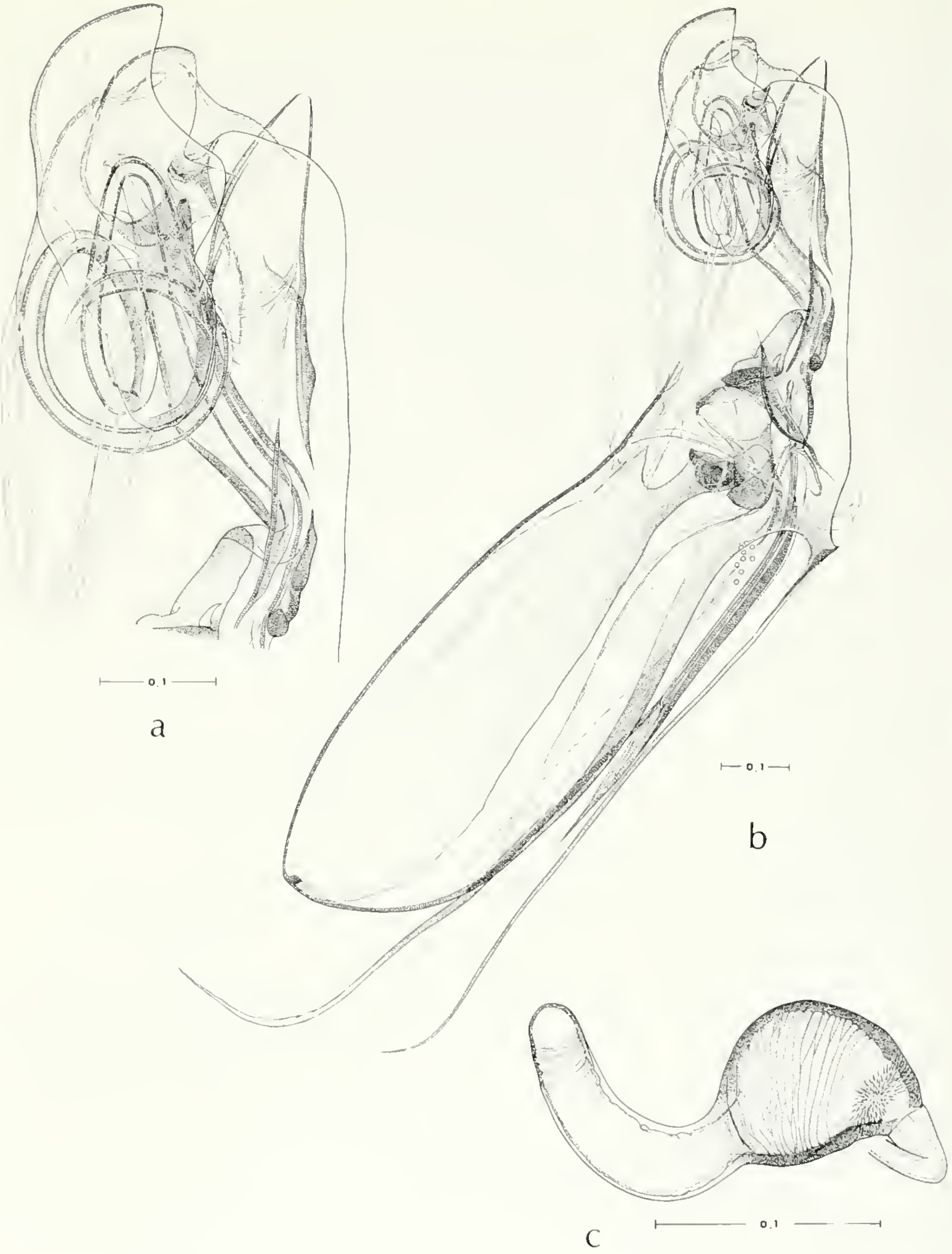


Fig. 7. *Rhopalopsyllus lugubris lugubris* Jordan and Rothschild. Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.

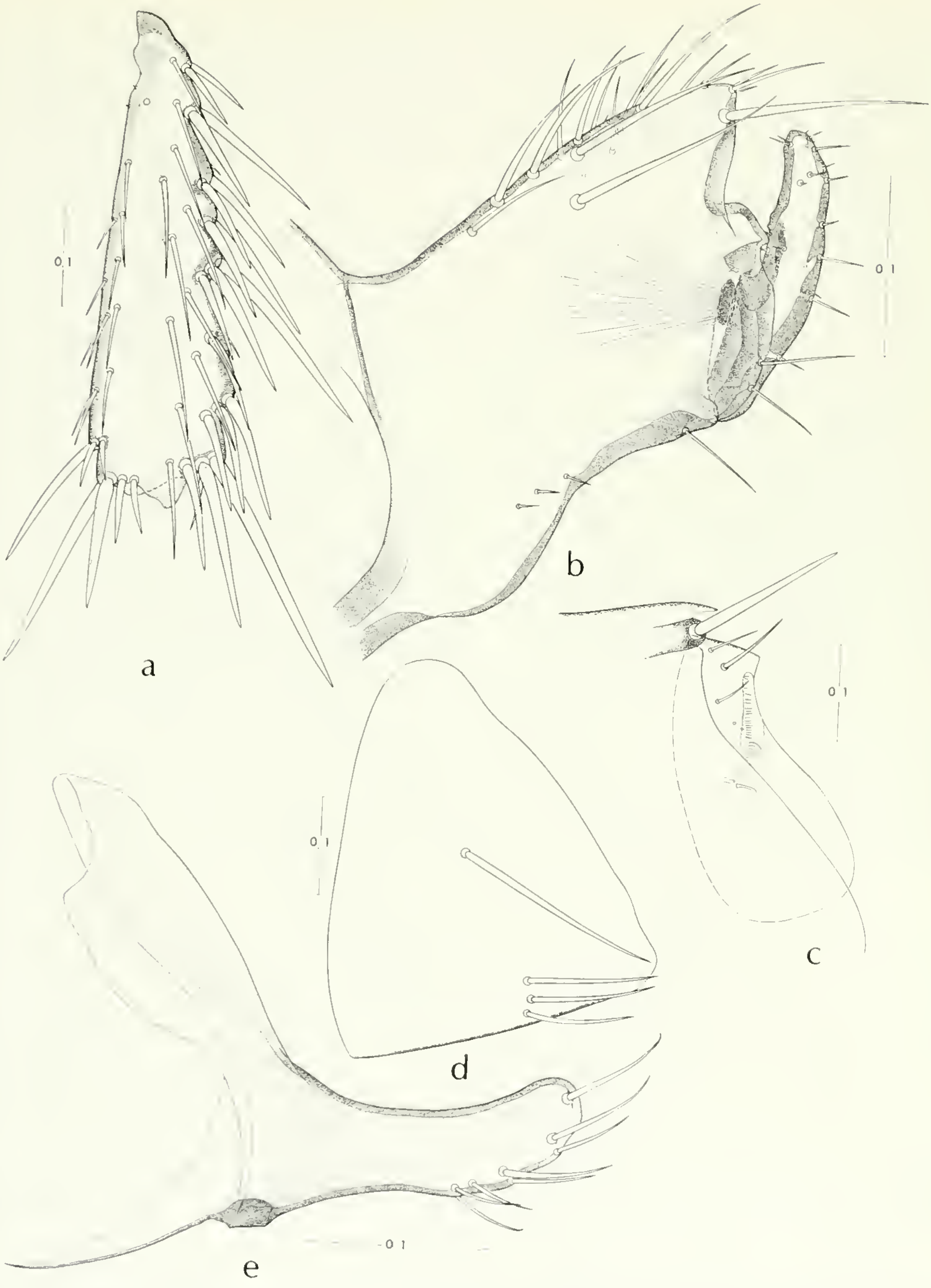


Fig. 8. *Polygenis atopus* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

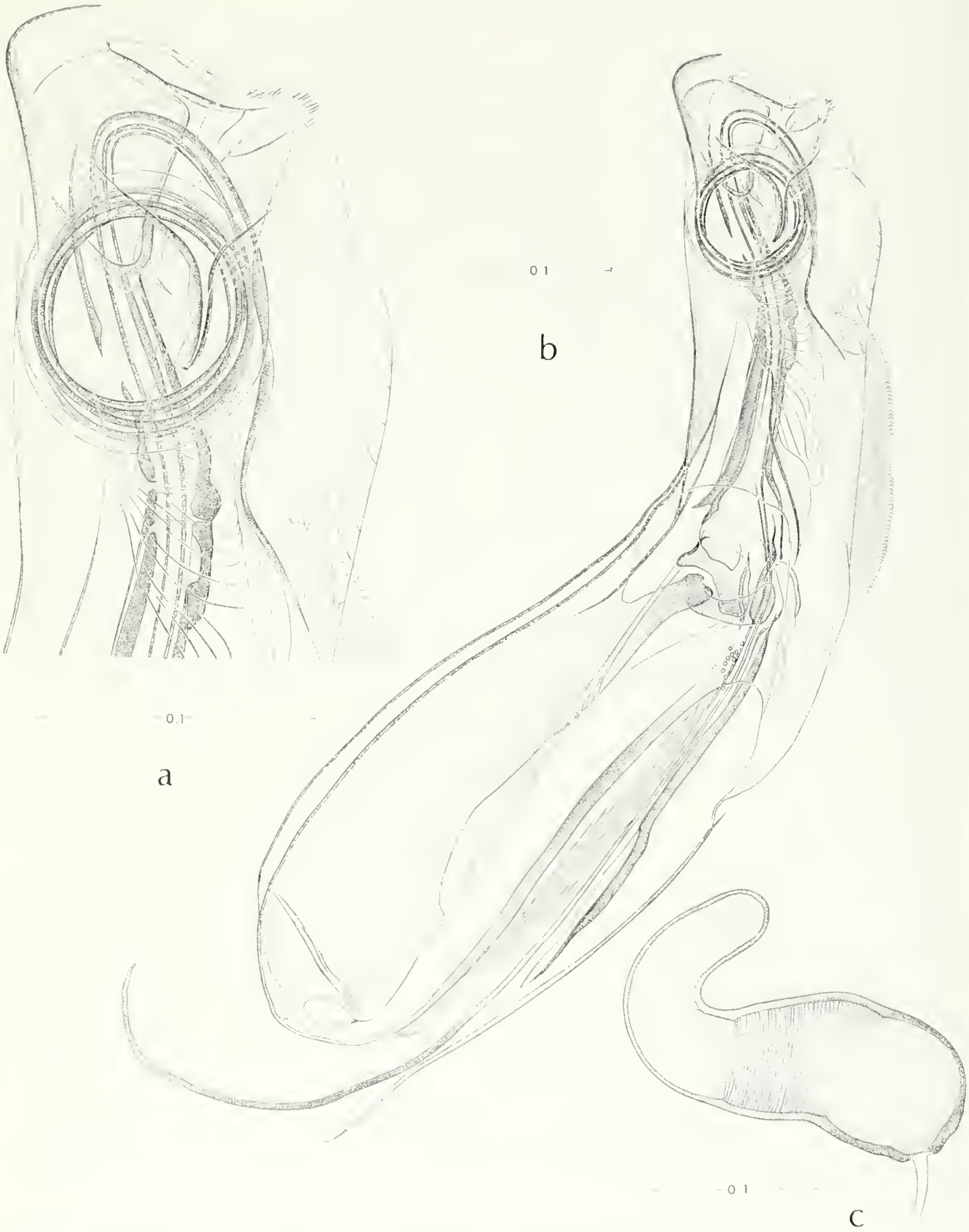


Fig. 9. *Polygenis atopus* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.

Other Recorded Distribution: Argentina: ex *Didelphis marsupialis*, *Didelphis marsupialis aurita*, and *Felis catus* (type of *truncatus*); Panama: *Peromyscus n. nudipes*, and *Oryzomys albigularis*.

Venezuelan Records (28 males and 20 females)

Eight males and 9 females ex 11 *Oryzomys albigularis* from Dto. Federal; 5 males and 5 females ex 3 *Neacomys tenuipes* from Dto. Federal and Trujillo; 4 males and 4 females ex 5 *Oryzomys concolor* from Dto. Federal and Trujillo; and 5 males and 2 females ex 3 *Didelphis marsupialis* Dto. Federal and Trujillo. Other hosts include: *Oryzomys minutus* (Dto. Federal). *Proechimys semispinosus* (Falcón), *Monodelphis brevicaudata* (Carabobo), and *Bradypus infuscatus* (Miranda).

Remarks

Specimens from Venezuela resemble illustrations given by Jordan and Rothschild (1922) except that the sinus in the caudal margin of the seventh sternum of the female is not quite so distinct as they have illustrated it. Our specimens are very close to those illustrated by Tipton and Mendez (1966) from Panama. Johnson (1965) studied the Panama specimens and suggested they were *P. atopus*. *P. atopus* is the only species in the genus which is not abundant at sea level. Most of our specimens were collected above 1400 meters elevation. Oryzomyines, and perhaps more specifically *Oryzomys* species, probably represent the preferred hosts of *P. atopus*. Marsupials may figure prominently in maintaining a link between populations which are more or less isolated at high elevations.

Polygenis bohlsi bohlsi (Wagner)
(Fig. 10, 11, 29f)

Pulex bohlsi Wagner, 1901:21, Pl. 1, Fig. 6.

Rhopalopsyllus bohlsi, Baker, 1905:130, 143.

Rhopalopsyllus bohlsi bohlsi, Guimarães, 1940: 234.

Polygenis bohlsi bohlsi, Guimarães, 1948: 540. Fig. 1d.—Traub and Johnson, 1952:127, Fig. 32-35.—Barrera and Diaz-Ungria, 1957: 164, 187, Lam. 1, Fig. 1-3.—Cova Garcia and Tallaferro, 1959: 329, 331, 332, 334, 346.—Machado-Allison, 1962*a*:181. — 1963:270, 276.—1966:26, 34, Fig. 5, 12.—Del Ponte, 1967:69.

Type Data: Hosts unknown, Paraguay: J. Bohls collector.

Other Recorded Distribution: Argentina: ex *Didelphys azarae* (= *Didelphis azarae*), *Deltamys kempi* (= *Akodon kempi*). Brazil: ex *Oryzomys expulsus* (= *Calomys expulsus*). Ecuador: ex *Nectomys saturatus* (= *N. squamipes saturatus*). Paraguay: ex *Didelphis azarae*. Venezuela: ex *Didelphis m. marsupialis*, *Sciurus granatensis chapmani*, *Heteromys a. anomalus*, *Oryzomys fulvescens delicatus*, *Oecomys t. trinitatis* (=*Oryzomys concolor*), *Neacomys spinosus* (=*N. tenuipes*), *Akodon urichi urichi*, *Sigmodon hispidus hirsutus*, *Rattus rattus frugivorus*, and *Proechimys cayennensis trinitatis* (=*P. semispinosus trinitatis*).

Venezuelan Records (51 males and 66 females)

There were 14 males and 21 females ex 15 *Akodon urichi* in Aragua, Bolivar, Carabobo, Dto. Federal, and Guárico; 12 males and 23 females ex 21 *Sigmodon hispidus* in Dto. Federal and Carabobo; 5 males and 3 females ex 5 *Monodelphis brevicaudata* in Aragua and Carabobo; and 4 males and 6 females ex 5 *Zygodontomys brevicauda* in Monagas and Sucre. Other hosts include: *Oryzomys albigularis* (Aragua). *Marmosa murina* (Bolivar), *Marmosa robinsoni* (Lara), *Proechimys semispinosus* (Carabobo). *Mustela frenata* (Monagas). *Oryzomys fulvescens* (Monagas and Carabobo). *Sigmomys alstoni* (Sucre), *Holochilus brasiliensis* (Apure and Carabobo), *Didelphis marsupialis* (Miranda). *Cavia porcellus* (Carabobo), *Sciurus igniventris* (Bolívar), and bird[1] (Carabobo).

Remarks

Our specimens differ considerably from specimens from Brazil loaned to us by Dr. Guimarães, but fit the description and illustrations given by Traub and Johnson (1952). We suggest that the optimum habitat is at elevations between 1,000 and 1,500 meters and the preferred hosts are cricetine rodents and perhaps more specifically akodont stock.

Polygenis dunni (Jordan and Rothschild)
(Fig. 12, 13)

Rhopalopsyllus dunni Jordan and Rothschild, 1922:269, Fig. 261, 262.—Jordan and Rothschild, 1923*b*:336, 351.

Rhopalopsyllus (*Polygenis*) *dunni*, Ewing and Fox, 1943:22.

Polygenis dunni, Costa Lima and Hathaway, 1946:144.—Johnson, 1957:160, 161.—Machado-Allison, 1962*b*:183.—1963:273, 276.—1966:19, 26, 34, 35, Fig. 5, 12.—Tipton and Mendez, 1966:298, 300, 326-332, Pl. 56, Fig. 1; Pl. 57, Fig. 1, 2.

Polygenis ambersoni Traub and Johnson, 1952: 112, Fig. 1-4, 6, 9, 10, 12-14, 16.—Barrera and Diaz-Ungria, 1957:164, 187.—Cova Garcia and Tallaferro, 1959:331, 341, 344, 346.

Type Data: Male holotype, paratype female ex *Sigmodon hispidus chiriquensis*, Panama:

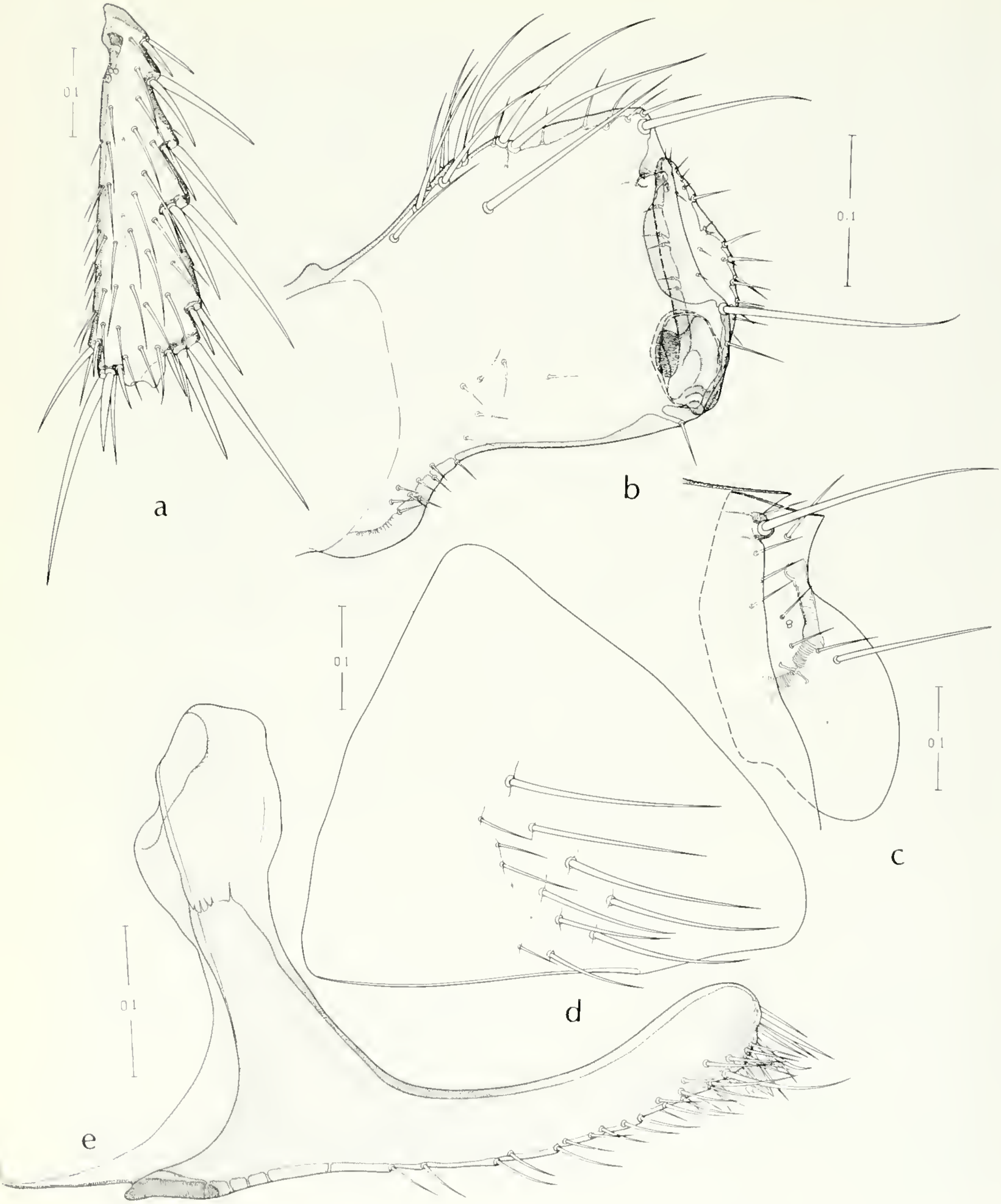


Fig. 10. *Polygenis bohlsi bohlsi* (Wagner). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

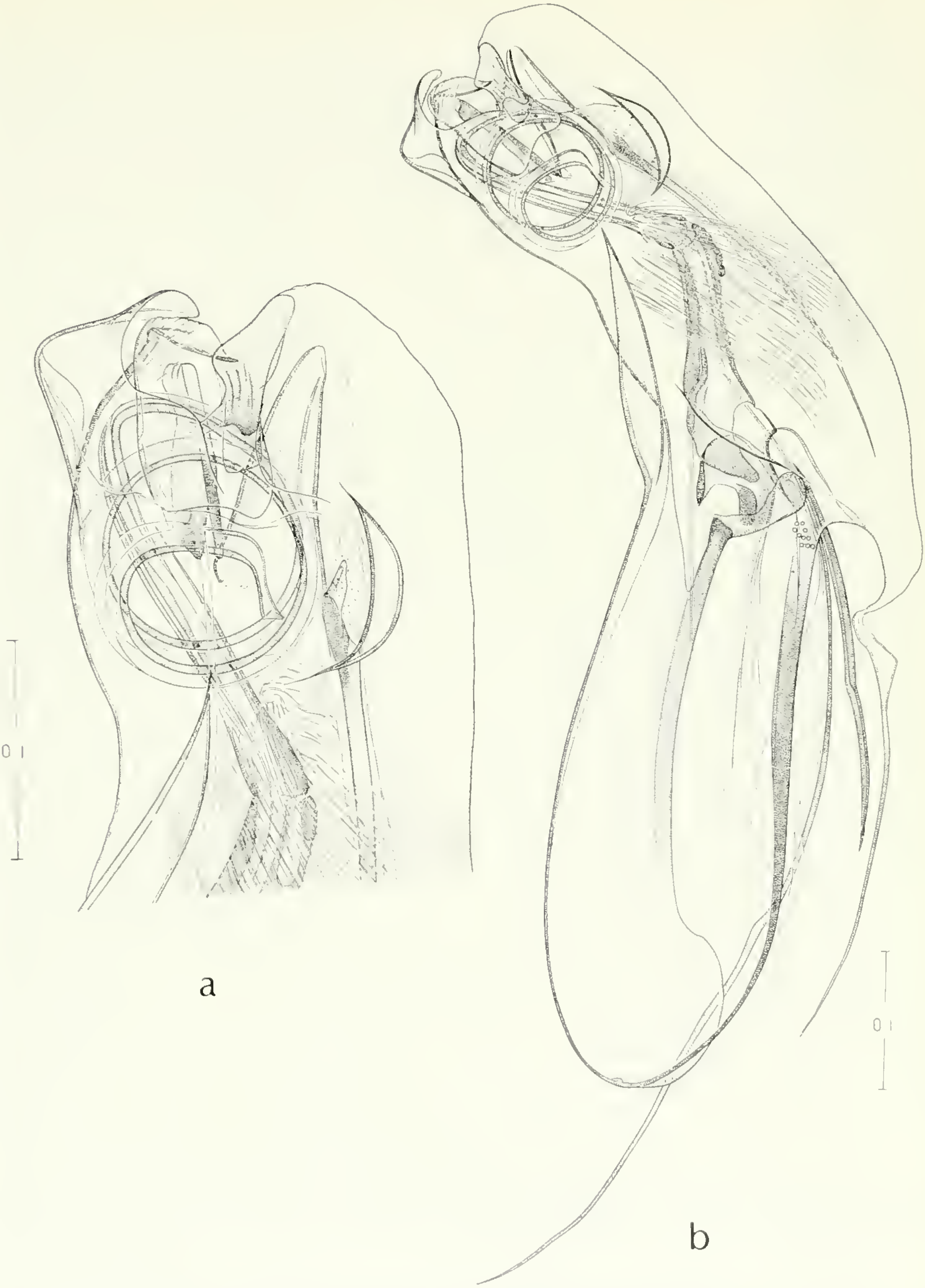


Fig. 11. *Polygenis bohlsi bohlsi* (Wagner). Male; a, apex of aedeagus. b, aedeagus.

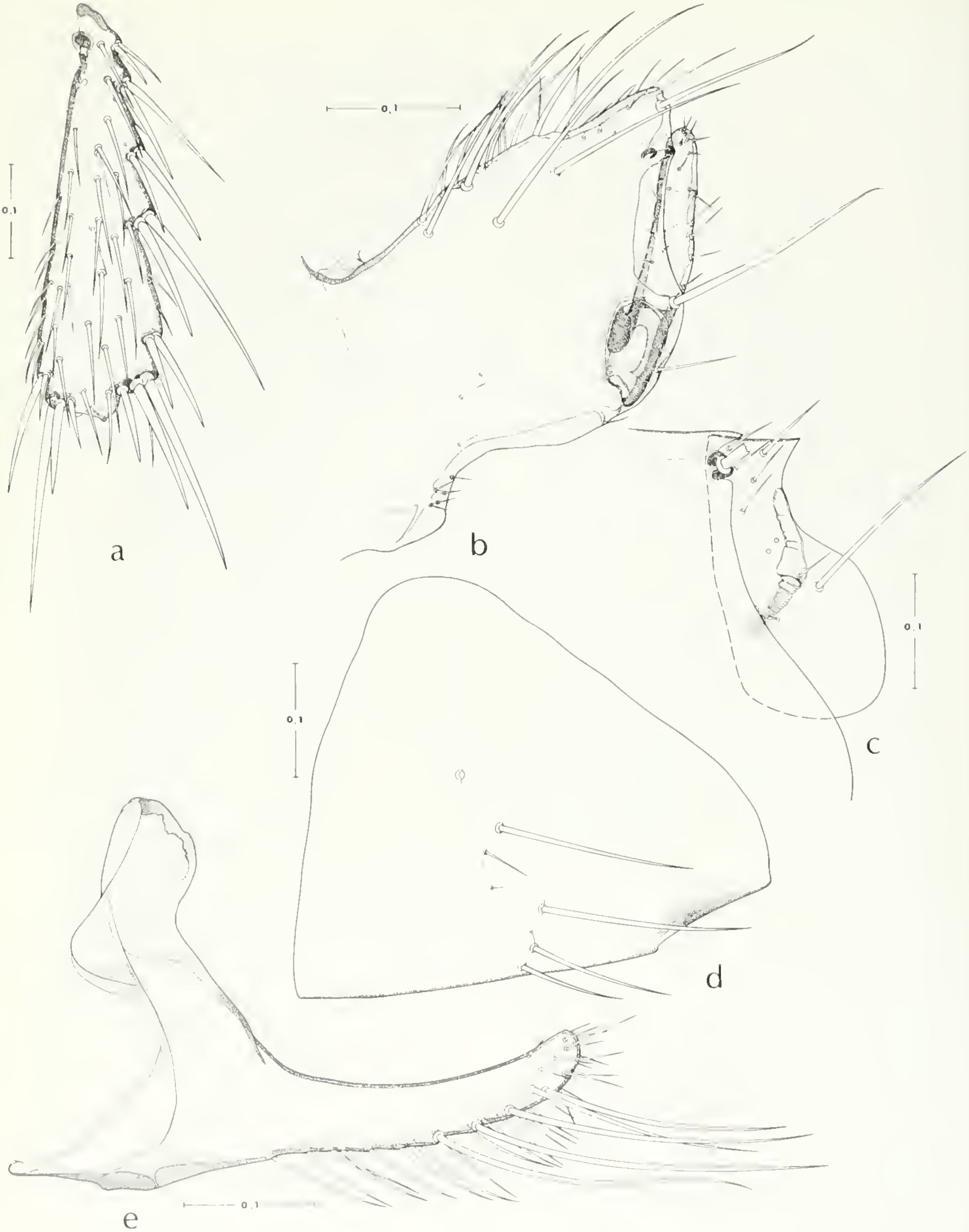


Fig. 12. *Polygenis dunni* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum

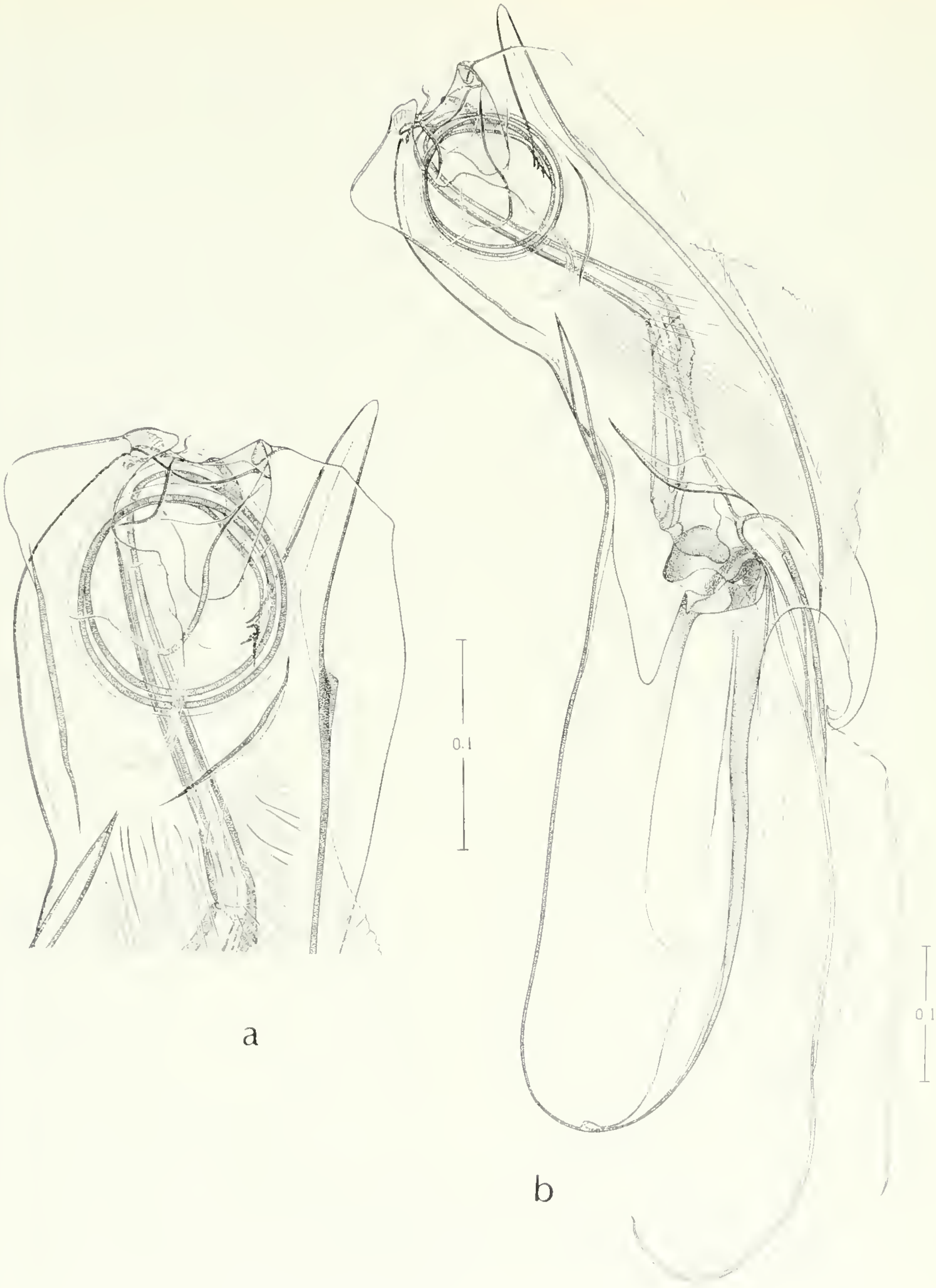


Fig. 13. *Polygenis dunni* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

Canal Zone, Ft. Clayton, L. H. Dunn collector.

Other Recorded Distribution: Venezuela: ex *Sigmodon hispidus hirsutus* (types of *ambersoni*). Trinidad: ex *Heteromys a. anomalus*, and *Nectomys squamipes palmipes*. Panama: ex *Liomys adspersus*, *Metachirus nudicaudatus dentaneus*, *Oryzomys capito*, *Proechimys semispinosus panamensis*, *Sciurus granatensis chiriquensis*, *Sigmodon hispidus chiriquensis*, and *Zygodontomys microtinus* (=*Z. brevicauda*).

VENEZUELAN RECORDS (87 males and 144 females)

There were 56 males and 95 females collected from 58 specimens of *Sigmodon hispidus* of which 48 hosts were collected in Carabobo and 10 in Lara; 9 males and 14 females ex 9 *Heteromys anomalus* (Zulia, Sucre, Falcón, and Trujillo), and 5 males and 8 females ex 8 *Zygodontomys brevicauda* (Falcón, Carabobo, Zulia, and Sucre). Other hosts include: *Proechimys semispinosus* (Zulia, Carabobo, and Lara), *Marmosa robinsoni* (Falcón), *Monodelphis brevicaudata* (Carabobo), *Didelphis marsupialus* (Guárico and Carabobo), *Holochilus brasiliensis* (Carabobo), *Nectomys squamipes* (Carabobo), *Oryzomys fulvescens* (Carabobo). *Cavia porcellus* (Carabobo), *Sciurus granatensis* (Carabobo), *Phyllostomus hastatus*[3] (Falcón), *Carollia perspicillata*,[3] (T. F. Amazonas), *Vampyrops helleri*[3] (Barinas), and bird[3] (Carabobo).

REMARKS

Male characters resemble very closely illustrations given by Traub and Johnson (1952) (as *P. ambersoni*). The four long bristles on the distal arm of the ninth sternum (DA9) are almost as long as DA9 itself but there is some variation in this character. There are 6 dorsal notches in the hind tibia and 2 bristles in the penultimate notch, but here again in some specimens there may be 7 notches on one leg and 6 on the other and there may be 3 bristles in the penultimate notch. The shape of the crochet appears to be intermediate between *P. dunni* and *P. peronis* as illustrated by Traub and Johnson (1952). It is difficult to separate the females from other closely related species of *Polygenis* and thus it is quite possible that some of the females assigned to this species on the basis of association with males or locality actually belong to another species.

Polygenis frustratus Johnson

(Fig. 14, 15, 29d)

Polygenis frustratus Johnson, 1957:161, 162, Pl. 86, Fig. 1-3, 7; Pl. 87, Fig. 1, 3, 5.—Del Ponte, 1967:57, 70, Fig. 21.

Type Data: Male holotype, female allotype, 2 male and 2 female paratypes ex unknown host, Brazil: State of Santa Catarina, Nova Teutonia, VII-1940, F. Plaumann collector. One male paratype *ibid*, but IV-1942.

Other Recorded Distribution: Argentina: ex species of the following genera: *Scapteromys*, *Oxymycterus*, and *Lutreolina*.

VENEZUELAN RECORDS (7 males and 14 females)

Nineteen specimens were collected near Caracas, Dto. Federal ex 11 *Akodon urichi*. A female specimen ex *Vampyrops oratus*[3] is probably in error. An additional male specimen ex *Akodon urichi* was collected in Sucre.

REMARKS

Our series probably represents an undescribed subspecies of *P. frustratus* but we are undecided whether it should be a subspecies of *P. frustratus* or *P. pradoi* since it has characters which relate it to both of these species. The immovable process and the movable process of the clasper are more like *P. pradoi* than *P. frustratus* in shape and setation. However, the incrassations of the posterior margin of the immovable process as well as the setae on the distal arm of the ninth sternum are like *P. frustratus*. The posterior margin of the eighth sternum is not sharply triangular as in *P. frustratus* and it is divided to about the same point as in *P. pradoi*. The detailed structure of the aedeagus resembles closely the illustrations given by Johnson (1957) for *P. frustratus*.

Polygenis impavidus Johnson

Polygenis impavidus Johnson, 1957:162, 163, Pl. 88.—Machado-Allison, 1962*b*:180. — Del Ponte, 1967:57, Fig. 17, 20.

Type Data: Holotype male, allotype female, ex "tara-tara"—"tree rat," Peru: Sandia Province, Dept. of Puno, Tambopata, San Juan, 30-XI-1950, Mrs. H. H. Heller collector. Two male and 2 female paratypes ex *Thomasomys* species, Peru: Dept. of Cuzco, Marcapata, Limapunce, 2400 m elev., 9-VII-1953, C. Kalinowski collector. Two male and 3 female paratypes, *ibid*, but ex *Didelphis* species, 15-VII-1953.

Other Recorded Distribution: None.

VENEZUELAN RECORDS (2 males and 2 females)

All 4 specimens were collected from 2 hosts, *Oryzomys albigularis*, in the state of Miranda near Caracas.

REMARKS

Our specimens key out to *P. impavidus* in Johnson's (1957) key. In her diagnosis she indicates that *P. impavidus* is the only species of

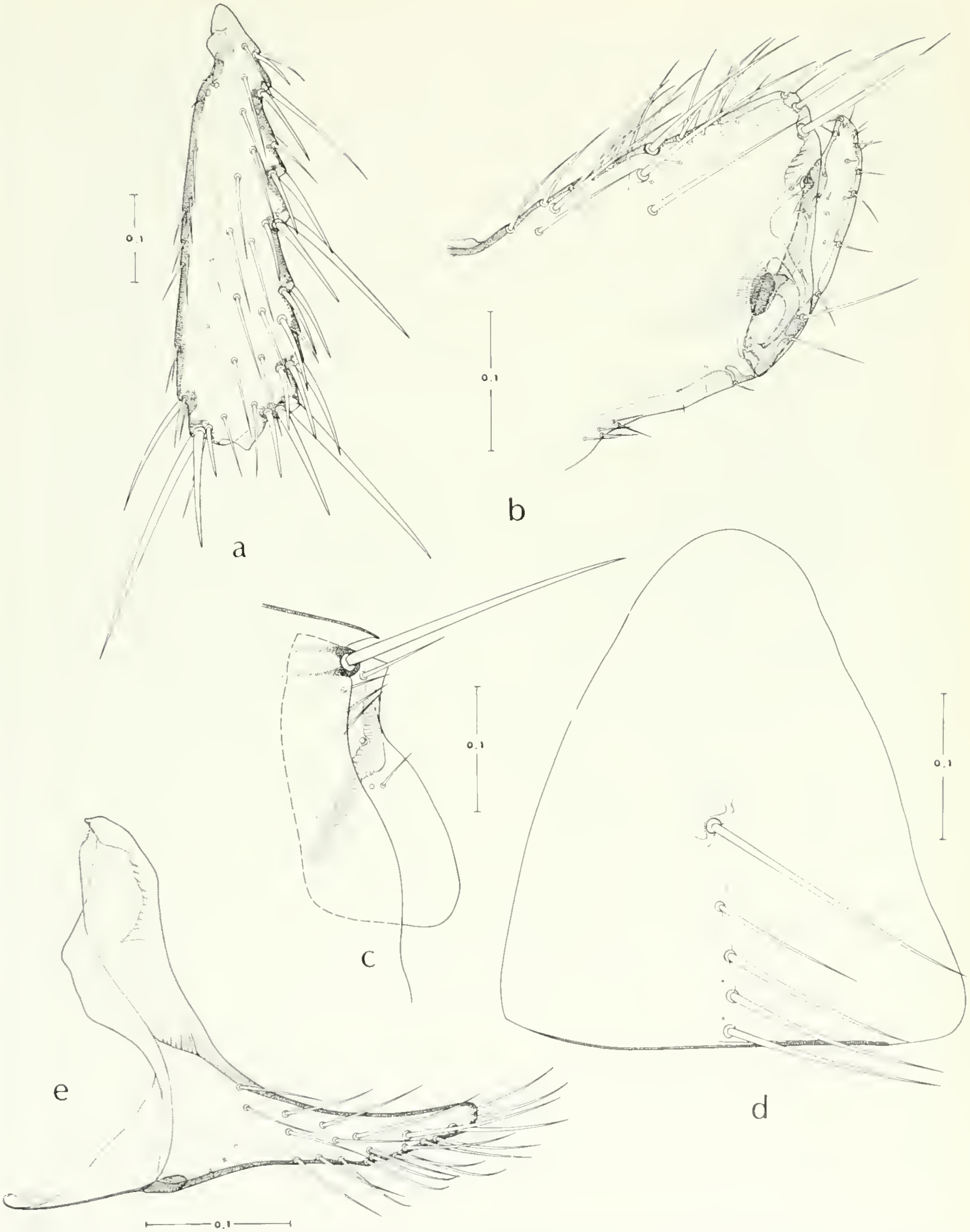


Fig. 14. *Polygenis frustratus* Johnson. Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

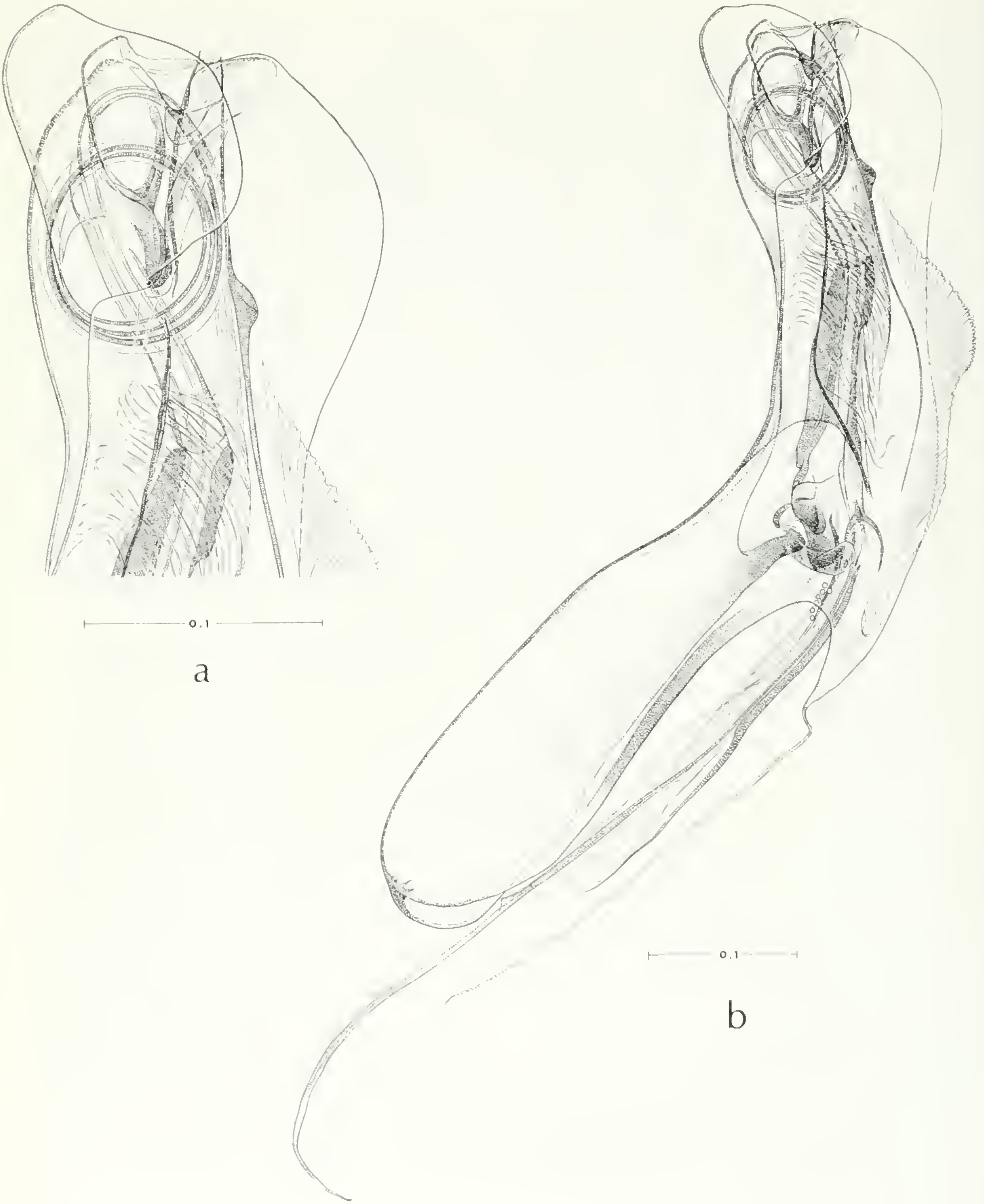


Fig. 15. *Polygenis frustratus* Johnson. Male. a, apex of aedeagus. b, aedeagus.

the genus with 6 dorsal notches on the metatibia and 3 bristles in the penultimate notch. Even though our specimens meet these criteria there are differences major enough to be at least on a subspecific level. For example, the distal arm of the ninth sternum is narrower at the base than at the apex while in *P. impavidus* the reverse is true. In the male the ventral margin of the eighth sternum is divided about half way between the apex and the row of lateral bristles; the division begins about one-fourth of the distance from the row of lateral bristles in our specimens. There are some differences in the details of the aedeagus, particularly the crochet and the distolateral lobe of the aedeagus. Assignment of these specimens to *P. impavidus* is provisional.

Polygenis klagesi klagesi (Rothschild)

Pulex klagesi Rothschild, 1904:620, Pl. 9, Fig. 28; Pl. 10, Fig. 35, 39.

Rhopalopsyllus klagesi, Baker, 1905:130,144.—Jordan and Rothschild, 1922:269.—Jordan and Rothschild, 1923*b*:331, 350.

Rhopalopsyllus klagesi klagesi, Jordan and Rothschild, 1923*b*:332, Fig. 343, 344.

Polygenis klagesi, Jordan, 1939:447.—Tipton and Mendez, 1966:298, Pl. 56, Fig. 3; Pl. 57, Fig. 5, 5a, 6, 6a, 6b.—Del Ponte, 1967:58.

Polygenis klagesi klagesi, Costa Lima and Hathaway, 1946:142. – Guimarães, 1948:139, Fig. 1h.—Cova Garcia and Tallaferro, 1959: 327, 331, 346.—Johnson, 1957:163, 164.

Tiamastus (Gephyropsylla) klagesi, Barrera, 1952:187-194. – Barrera and Diaz-Ungria, 1957:184. – Machado-Allison, 1963:276. – 1966:23, 26, 32, Fig. 12.—Machado-Allison and McClure, 1963:421-436.

Type Data: A series of 12 males, 17 females, ex "spring rat" ("spiney rat"?), Venezuela Bolivár, Caura River, La Vuelta, 17-V-1903, S. M. Klages collector.

Other Recorded Distribution: Brazil: ex *Dasypus novemcinctus*, *Metachirus opossum* (=*Philander opossum*), and "rato do mato." Colombia: ex *Proechimys cayennensis chrysaeolus* (=*P. semispinosus chrysaeolus*) and *Dasyprocta variegata*.

Venezuelan Records (279 males and 339 females)

Since more than 96% of our specimens were collected from 129 specimens of *Proechimys semispinosus* and *Proechimys guyannensis* we have chosen to list records in chart form given in Table 1.

In addition there was one female each from Carabobo and Sucre on *P. semispinosus*. The remaining 24 specimens of *P. klagesi klagesi* were ex: *Agouti paca* (Zulia), *Akodon urichi* (Bolívar), *Desmodus rotundus*[3] (T. F. Amazonas), *Didelphis marsupialis* (T. F. Amazonas, Bolivar, Trujillo, and Zulia), *Echimys armatus* (Apure), *Felis pardalis* (Bolivar), *Mazama americana* (Bolivar), *Molossus ater*[3] (Monagas), *Monodelphis brevicaudata* (Barinas), *Oryzomys minutus* (Táchira), *Sigmodon hispidus* (Carabobo), *Tapirus terrestis* (Apure). Bat hosts probably represent contaminations or errors in record keeping and it is possible that this may be the case for some of the other hosts as well.

Remarks

See: *Polygenis klagesi samuelsis*

Polygenis klagesi samuelis
(Jordan and Rothschild)

(Fig. 16, 17, 18, 29e)

Rhopalopsyllus klagsei samuelis Jordan and Rothschild, 1923*b*:331, Fig. 342, 344.

Rhopalopsyllus (Polygenis) klagesi samuelis, Ewing and Fox, 1943:22.—Anduze, Vogelsang, and Pifano, 1947:5.

Polygenis klagesi samuelis, Costa Lima and Hathaway, 1946:142 .— Barrera, 1952:187. — Traub and Johnson, 1952:128. – Johnson, 1957:164.—Cova Garcia and Tallaferro, 1959: 331, 346.—Tipton and Mendez, 1966:299.— Del Ponte, 1967:59.

Tiamastus (Gephyropsylla) klagesi samuelis, Barrera 1952:187-194. – Barrera and Diaz-Ungria, 1957:164, 184. – Machado-Allison, 1962*b*:186. – 1963:276. – 1966:26, 32.—Machado-Allison and McClure, 1963:421-436.

Type Data: Male holotype plus paratype specimens ex *Didelphis marsupialis* and *Oryzomys laticeps* (=*O. capito*), Venezuela: San Esteban; additional specimens ex *Proechimys*

Table 1. Venezuelan Records of *Polygenis klagesi klagesi* (Rothschild) According to Host and Locality.

State or Territory	No. of Hosts *P. semispinosus*	Fleas Males	Females	Index
T. F. Amazonas	9	18	18	4.0
Apure	51	118	160	5.45
Barinas	19	67	80	7.73
Zulia	16	18	19	2.31
Subtotal	95	221	277	5.24
	P. guyannensis			
T. F. Amazonas	19	14	20	1.79
Bolivár	15	32	28	4.0
Subtotal	34	16	48	2.76
Total	129	267	325	4.59

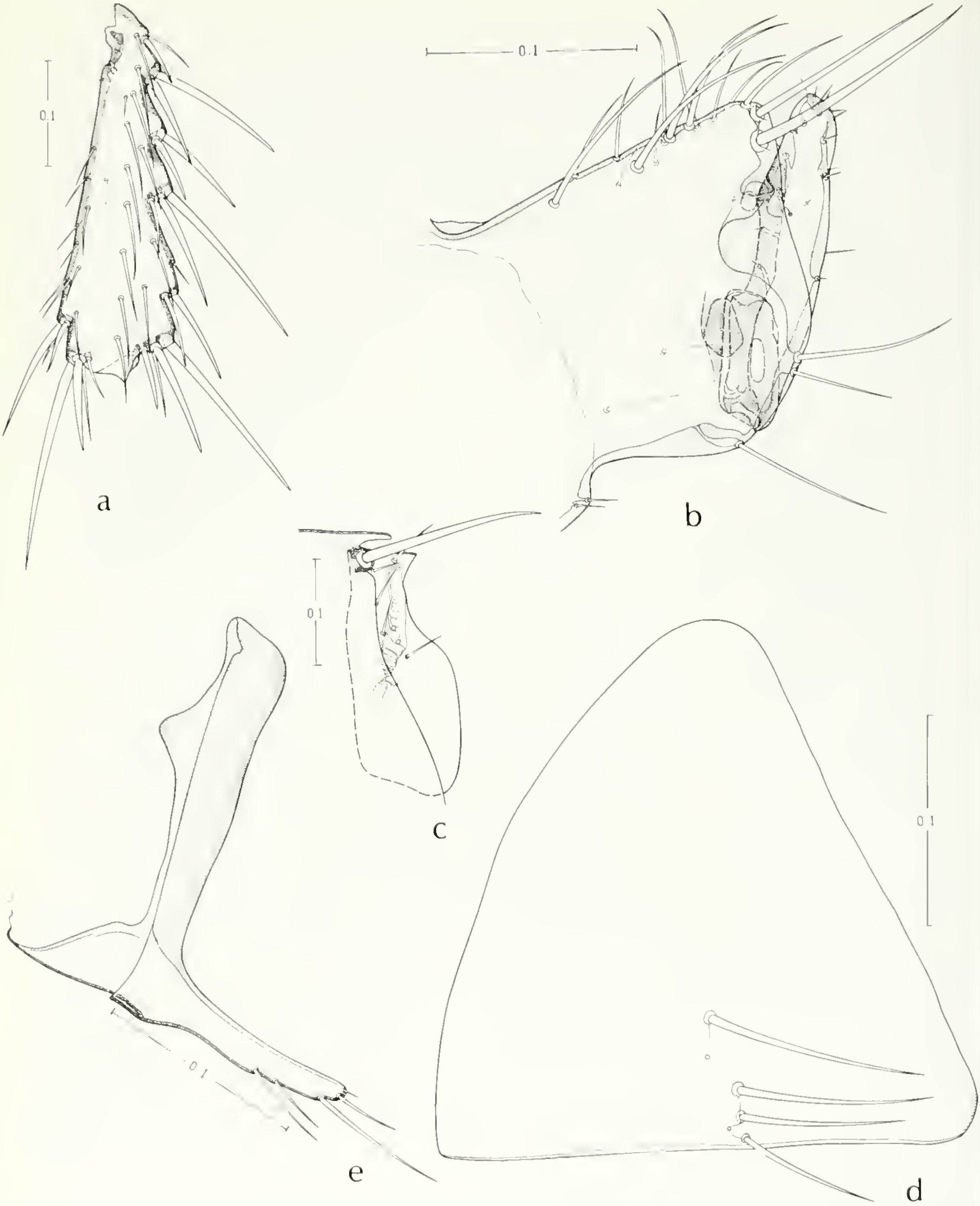


Fig. 16. *Polygenis klagesi samuelis* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

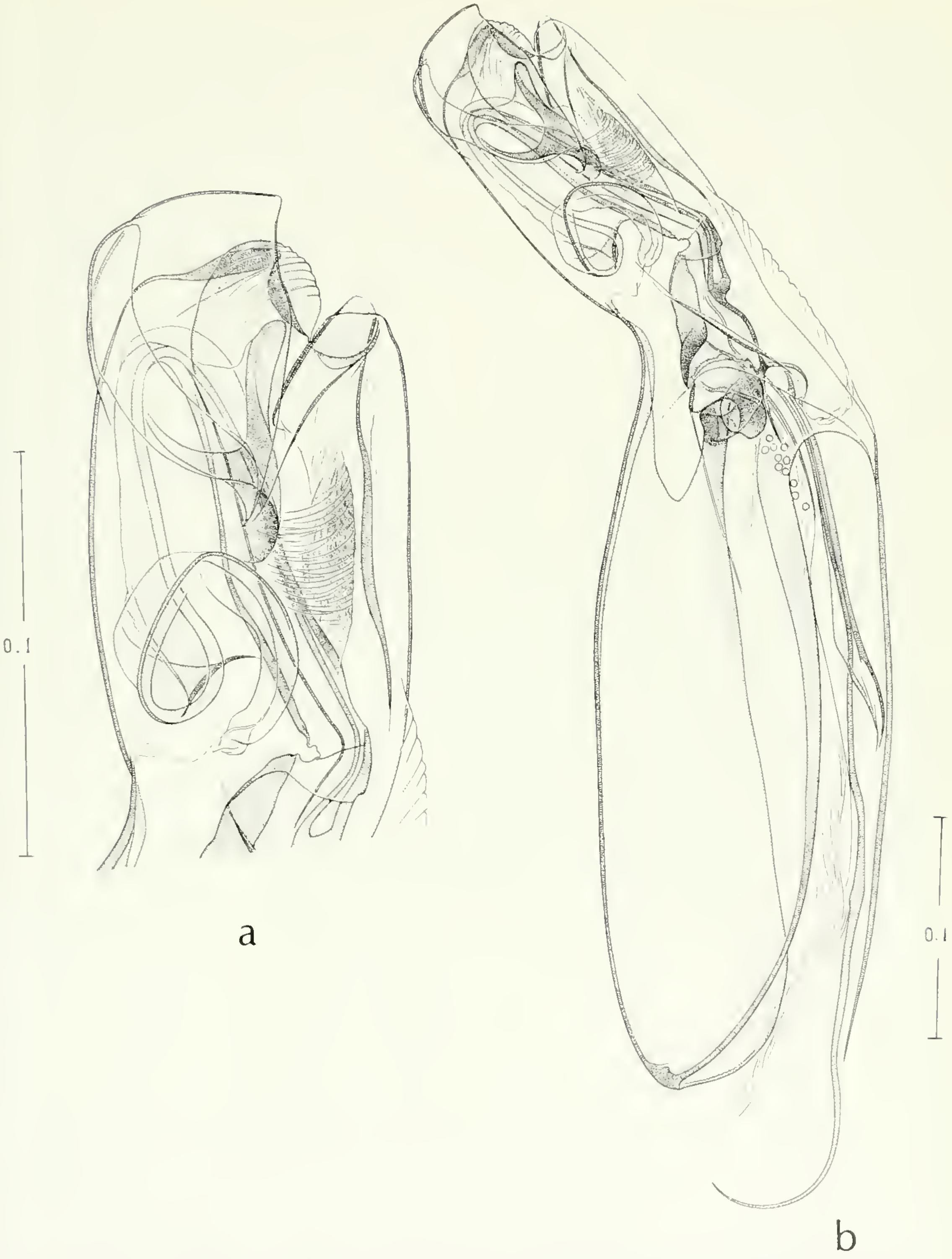


Fig. 17. *Polygenis klagesi samuelis* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

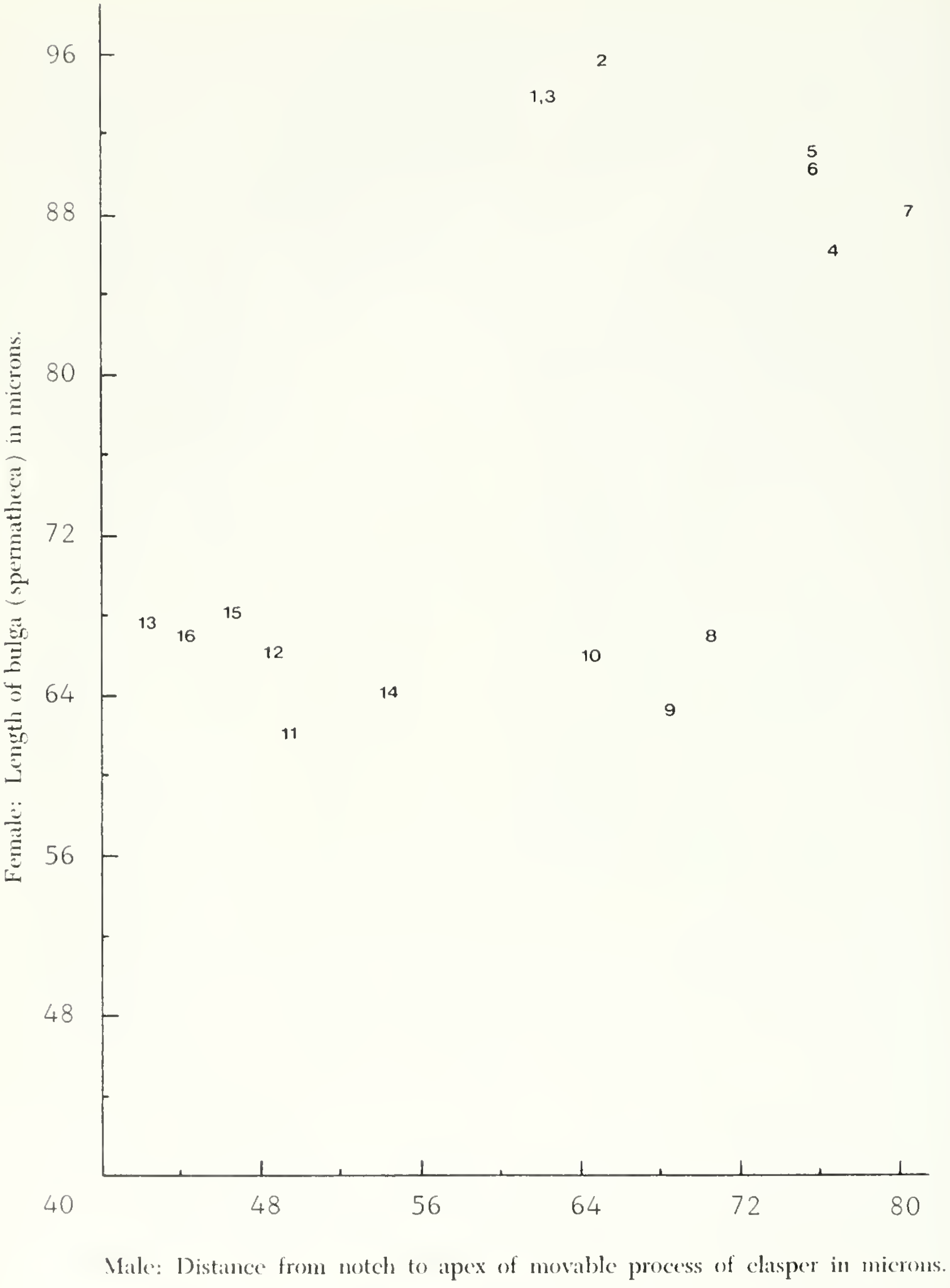


Fig. 18. Scattergraph showing relationship between *Polygenis klagesi klagesi* and *P. klagesi samuelis* based on length of bulga of the spermatheca and the distance from the notch to the apex of the movable process of the clasper.

guairae (= *P. semispinosus*), same locality. One male and 2 females ex *Felis pardalis mearnsi* and *Proechimys semispinosus panamensis*, Panama: Canal Zone, Pedro Miguel, L. H. Dunn collector.

Other Recorded Distribution: Venezuela: ex *Sciurus griseogena meridensis* (=*S. granatensis meridensis*), *Oryzomys concolor speciosus*, *Proechimys cayennensis guairae* (=*P. semispinosus guairae*), *Akodon u. urichi*, *Didelphis m. marsupialis*, *Proechimys cayennensis trinitatis* (=*P. semispinosus trinitatis*), *Rattus rattus frugivorous.*

VENEZUELAN RECORDS (353 males and 401 females)

As with *P. klagesi klagesi* most (91%) of our specimens of *P. klagesi samuelis* were collected from *Proechimys semispinosus.*

Hosts from which the remaining 61 specimens of *P. klagesi samuelis* were collected were: *Artibeus cinerus*[3] (Dto. Federal), *Artibeus lituratus*[3] (Trujillo). *Conepatus semistriatus* (Falcón), *Didelphis marsupialis* (Falcón, Lara, and Monagas), domestic horse (Falcón), *Monodelphis brevicaudata* (Barinas), *Oryzomys minutus* (Merída). *Proechimys canicollis* (Zulia), *Sigmodon hispidus* (Lara), snake[3] (Carabobo),*Tamandua longicaudata* (Lara), *Uroderma bilobatum*[3] (Falcón), *Vampyrops helleri*[3] (Yaracuy), and *Zygodontomys brevicauda* (Sucre).

Table 2. Venezuelan Records of *Polygenis klagesi samuelis* (Jordan and Rothschild) from *Proechimys semispinosus* According to State.

State	No of Hosts *P semispinosus*	Fleas Males	Females	Index
Barinas	2	0	3	1.5
Carabobo	19	44	58	5.4
Falcón	28	55	56	4.0
Guárico	4	14	32	11.5
Lara	14	106	108	15.3
Monagas	5	21	12	6.6
Sucre	14	59	54	8.1
Trujillo	10	24	27	5.1
Yaracuy	3	6	6	4.0
Zulia	3	0	3	1.0
Total	102	329	359	6.7

REMARKS

We selected 10 female specimens (fewer than 10 in 4 instances) from each of 16 localities and measured the bulga (spermatheca). The average was computed (in microns) and plotted on the Y axis (ordinate) of a scatter graph. (Fig. 18). The same procedure was followed for males except the measurements were made of the distance from the notch on the anterior margin of the movable process of the clasper to its apex. The average of these measurements was plotted on the X axis (abscissa).

Specimens from Trujillo (11. Agua Santa), Falcón (12. Mirimire), Guárico (13. San Juan), Carabobo (14. Montalbán), Monagas (15. Caripe), and Sucre (16. Manacal) are clearly *samuelsis.* Specimens from Apure (4. Nulita), Zulia (5. Encontrados and 6. Machiques), and Barinas (7. Altamira) are clearly *klagesi.* Female specimens from Amazonas (1. Esmeralda) and Bolívar (2. Icabarú and 3. Ciudad Bolívar) fit the criteria for *klagesi* but the males are intermediate. Likewise, females from Falcón (8. Socopo), Lara (9. El Tocuyo), and Yaracuy (10. San Felipe) fit the criteria for *samuelis* but the males are intermediate. Machado-Allison and McClure (1963) found no evidence of hybridization between the two subspecies. Their map showing the distribution of the two subspecies is substantiated by our findings. Based on female specimens alone the Orinoco River appears to be the dividing line between the two subspecies in eastern Venezuela but in western Venezuela a line extending from San Felipe to El Tocuyo. thence to Socopo (in Falcón about 100 km east of Maracaibo) and then west across Lake Maracaibo and Zulia represents the area where the two subspecies meet. An exception to this is represented by a collection of 24 male and 27 female specimens of *samuelis* from the Agua Santa area (Trujillo) which is about 100 km south of Socopo.

Our specimens were collected almost exclusively from *Proechimys semispinosus* and mostly in dry tropical forests. *Polygenis k. klagesi*, on the other hand, seems to be more closely associated with humid tropical forests. If the barrier between the two subspecies is ecological rather than geographical this may help to explain the disjunct distribution in western Venezuela.

Table 3. Measurement and Locality Data Used in Scattergraph.

Locality	Female Length of bulga in microns		Male Measurement of movable process of clasper in microns	
1. T. F. Amazonas: Esmeralda	*94	(10)	62	(10)
2. Bolívar: Icabarú	98	(10)	65	(10)
3. Bolívar: Ciudad Bolivar	93	(4)	62	(5)
4. Apure: Nulita	86	(10)	76	(10)
5. Zulia: Encontrados	91	(10)	75	(10)
6. Zulia: Machiques	90	(8)	75	(6)
7. Barinas: Altamira	88	(10)	80	(10)
8. Falcón: Socopo	67	(9)	71	(10)
9. Lara: El Tocuyo	63	(10)	67	(10)
10. Yaracuy: San Felipe	66	(5)	64	(5)
11. Trujillo: Agua Santa	62	(10)	49	(10)
12. Falcón: Mirimire	66	(10)	48	(10)
13. Gúrico: San Juan	68	(10)	42	(10)
14 Carabobo: Montalbán	64	(10)	54	(10)
15. Monagas: Caripe	68	(10)	46	(10)
16. Sucre: Manacal	67	(10)	44	(10)

*94 average of (10) specimens measured

Polygenis occidentalis steganus (Jordan and Rothschild)
(Fig. 19, 20, 29h)

Rhopalopsyllus steganus Jordan and Rothschild, 1923*b*:338, Fig. 356.—I. Fox, 1947:117.

Polygenis steganus, Costa Lima and Hathaway, 1946:144.—Traub and Johnson, 1952:128.—Barrera and Diaz-Ungria, 1957:164, 186.—Cova Garcia and Tallaferro, 1959:328, 331, 347.

Rhopalopsyllus (*Polygenis*) *steganus*, Anduze, Vogelsang, and Pifano, 1947:5.

Polygenis occidentalis steganus, Johnson, 1957: 166.—Machado-Allison, 1962*b*:179.—1963:272, 276.—1966:26, 34, Fig. 12.—Del Ponte, 1967: 60.

Type Data: Holotype male ex *Sturnira lilium*, Venezuela: San Esteban, I-1911, S. M. Klages collector.

Other Recorded Distribution: Trinidad: ex opossum and *Oryzomys* species (males only). Venezuela: ex *Didelphis m. marsupialis* (males only), and *Sciurus griseogena meridensis* (=S. *granatensis meridensis*).

Venezuelan Records (9 males and 9 females)

Sixteen specimens were collected in Monagas ex 4 *Rhipidomys venustus*, 2 *Didelphis marsupialis*, 1 *Sturnira lilium*[2], and 1 *Sciurus granatensis*. The remaining 2 specimens were collected from *Proechimys semispinosus* in Yaracuy and *Rhipidomys couesi* on Nueva Esparta.

Remarks

A comparison of our male specimens with Figure 356 in Jordan and Rothschild (1923) indicates some differences. The distal arm of the ninth sternum is not quite so robust and the caudal margin of the eighth sternum is more sharply incised in our specimens. We count fewer than 20 bristles on the hind tibia (usually 18 or 19) whereas in Johnson's (1957) key there are more than 20 bristles on the hind tibia of *P. occidentalis steganus*.

Polygenis peronis (Jordan and Rothschild)
(Fig. 21, 22, 29g)

Rhopalopsyllus peronis Jordan and Rothschild, 1923*b*:340, Fig. 353, 359.—I. Fox, 1947:117.

Rhopalopsyllus (*Polygenis*) *peronis*, Anduze, Vogelsang, and Pifano, 1946:5.

Polygenis peronis, Costa Lima and Hathaway, 1946:144. — Traub and Johnson, 1952:112, 128, 131, Fig. 5, 7, 8, 11, 15, 17.—Johnson, 1957:157, 166. — Barrera and Diaz-Ungria, 1957:164, 186.—Cova Garcia and Tallaferro, 1959:328, 331, 332, 341, 344, 346.—Machado-Allison, 1962*b*:183, 184.—1963:276.—1966:26, 34, Fig. 12.—Del Ponte, 1967:59.

Type Data: Three males, 2 females, ex *Heteromys melanoleucus* (=*H. anomalus*), probably collected from Venezuela or Colombia.

Other Recorded Distribution: Venezuela: ex *Heteromys anomalus*, *Sigmodon hispidus hirsutus*, and *Akodon u. urichi*.

Venezuelan Records (9 males and 7 females)

There were 14 specimens collected from *Heteromys anomalus* in Dto. Federal and Aragua. The remaining two specimens were from *Oryzomys albigularis* in Aragua, and *Vampyrops oratus*[3] in Miranda.

Remarks

Our specimens key to *P. occidentalis steganus* in Johnson's (1957) key. The critical character is the position of the acetabular bristle on the posterior margin of the immovable clasper which we have found to be variable. It is slightly above the dorsal margin of the acetabulum in our specimens. The caudal margin of the eighth sternum is not as rounded in our specimens as shown by Jordan and Rothschild (1923, Fig. 359). Most of our specimens were collected from *Heteromys anomalus* and the type specimens were also collected from the same species in Colombia or Venezuela.

Polygenis roberti beebei (I. Fox)
(Fig. 23, 24, 29c)

Pulex roberti Rothschild, 1905:479, Pl. 13, Fig. 1, 2.

Rhopalopsyllus roberti, Jordan and Rothschild, 1923*b*:330.

Rhopalopsyllus beebei I. Fox, 1947:117, 118, Fig. 2.

Polygenis roberti, Macchiavello, 1948:17.—Guimarães, 1940:233.—1948:540, 541.

Polygenis roberti beebei, Traub and Johnson, 1952:123-127, 131, 132, Fig. 18-28, 30.—Johnson, 1957:168. — Barrera and Diaz-Ungria, 1957:164, 185, 186.—Cova Garcia and Tallaferro, 1959:329, 331, 347.—Machado-Allison, 1963:276.—1966:26, 34, Fig. 12.—Tipton and Mendez, 1966:299, 300, Pl. 56, Fig. 2; Pl. 57, Fig. 3, 4.—Del Ponte, 1967:57.

Type Data: Holotype male, ex *Didelphis marsupialis*, Venezuela: Aragua, Rancho Grande Biological Station, 1098 m elev. 3-VIII-1946, W. Beebe collector.

Other Recorded Distribution: Panama: ex *Philander opossum fuscogriseus*, *Marmosa robinsoni*, *Metachirus nudicaudatus dentan-*

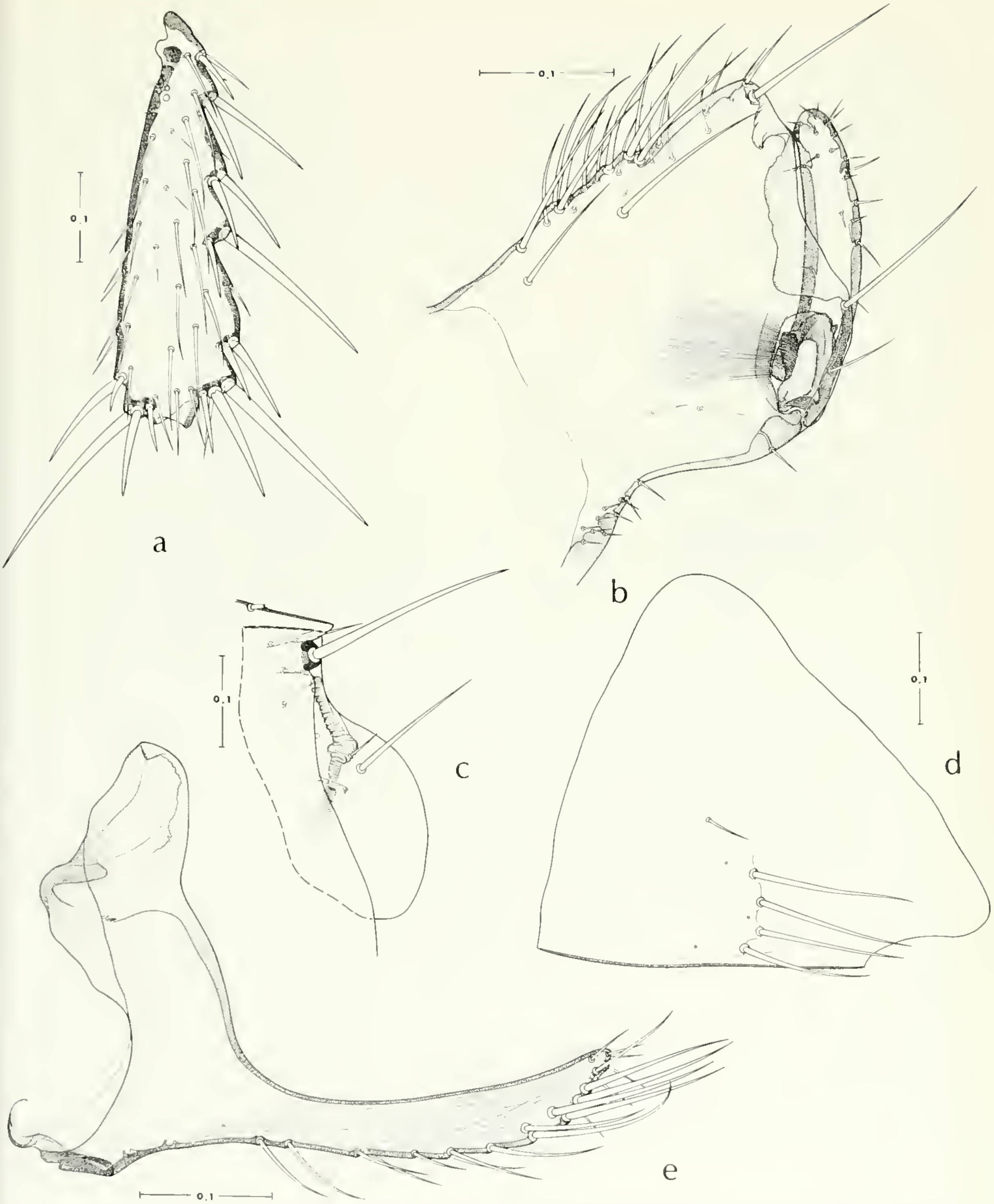


Fig. 19. *Polygenis occidentalis steganus* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

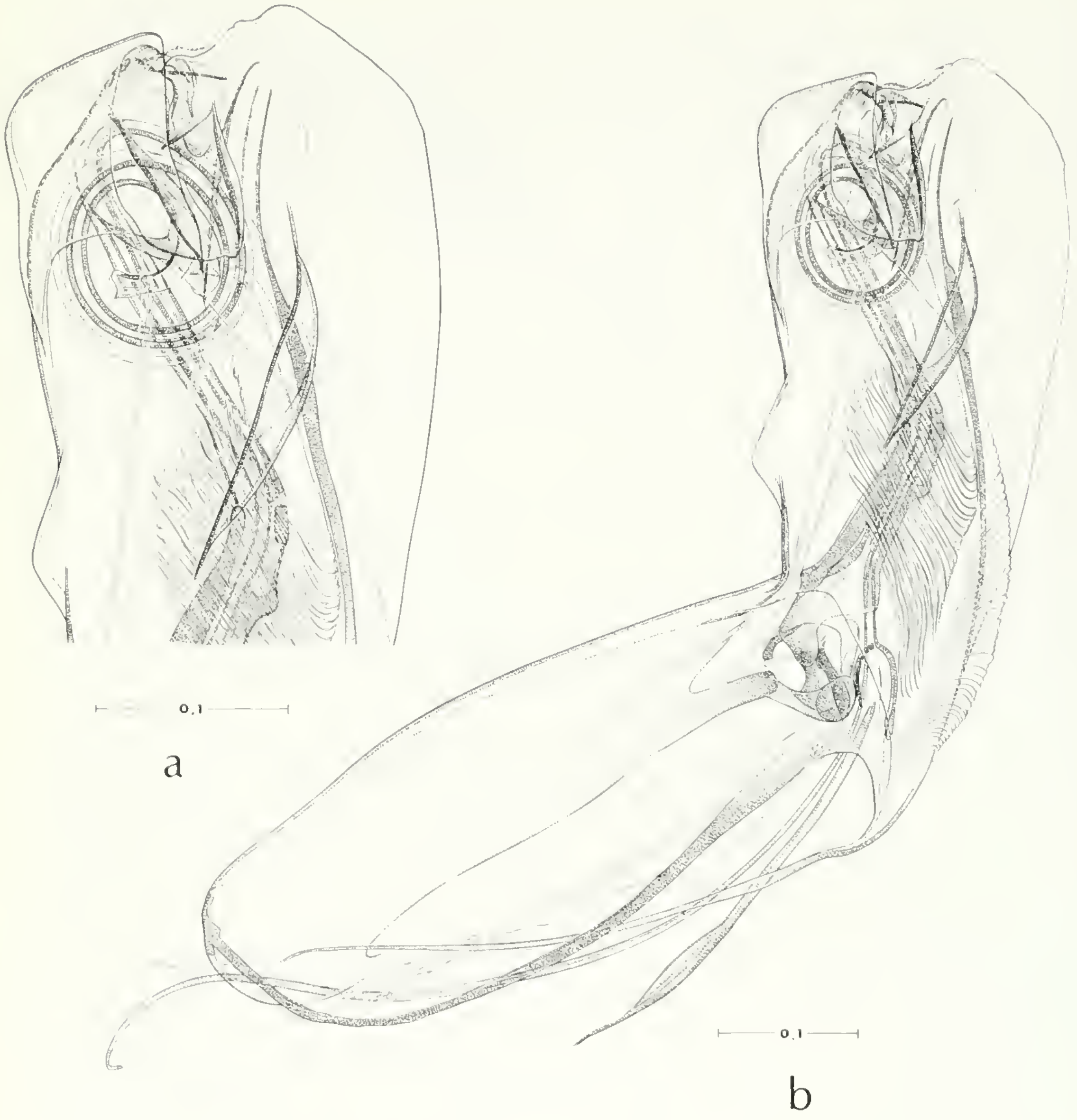


Fig. 20. *Polygenis occidentalis steganus* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

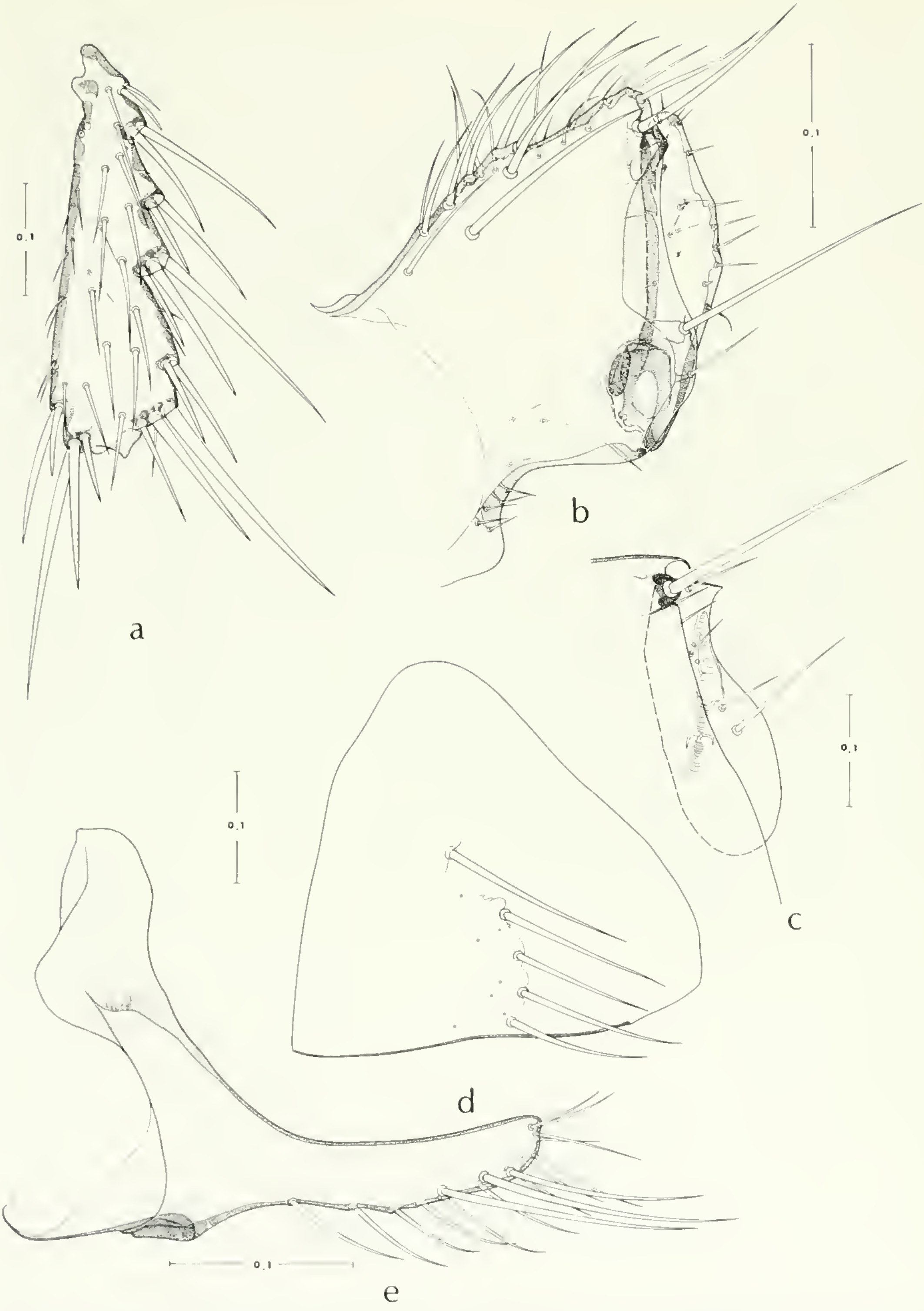


Fig. 21. *Polygenis peronis* (Jordan and Rothschild). Male: a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

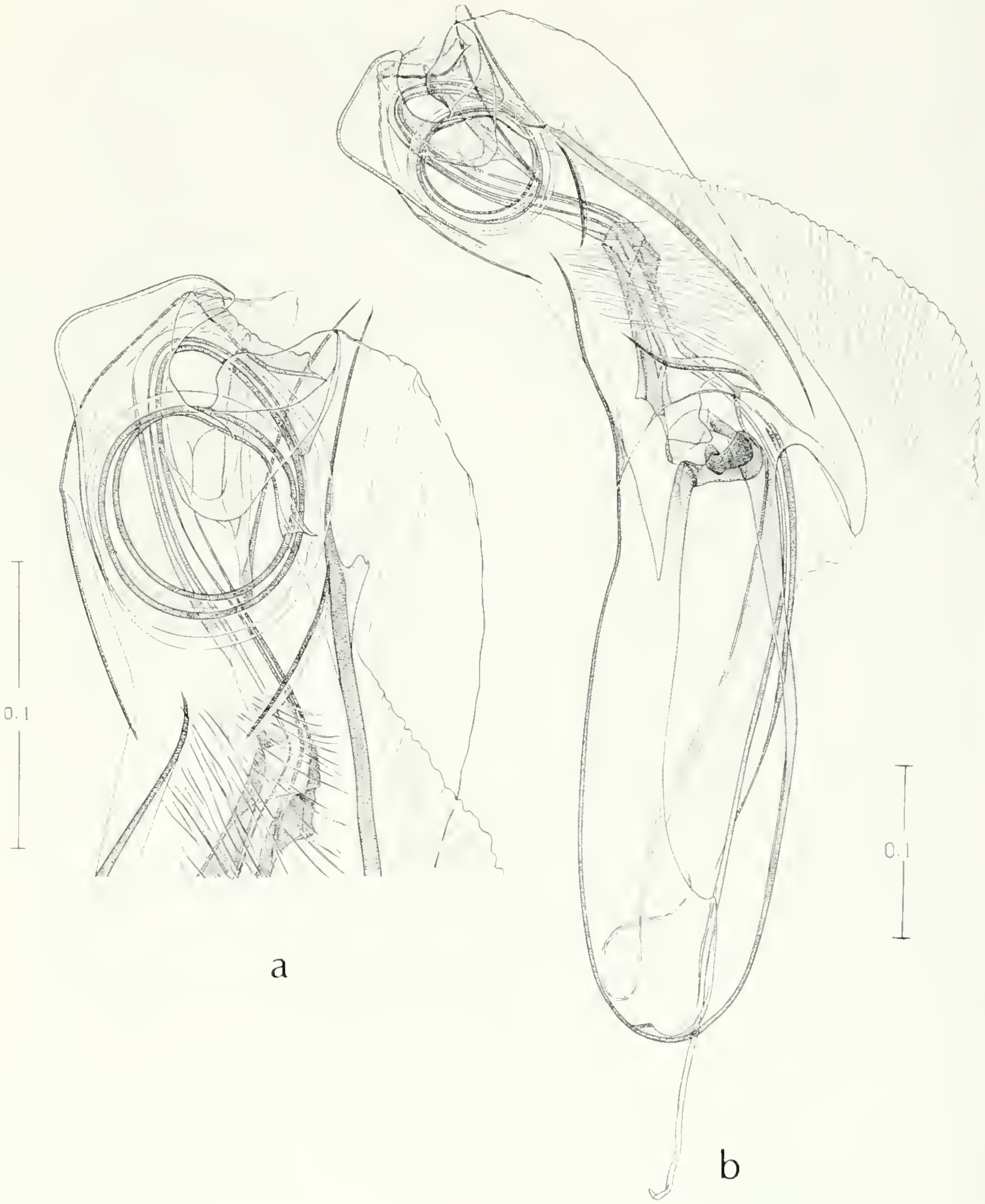


Fig. 22. *Polygenis peronis* (Jordan and Rothschild). Male: a, apex of aedeagus. b, aedeagus.

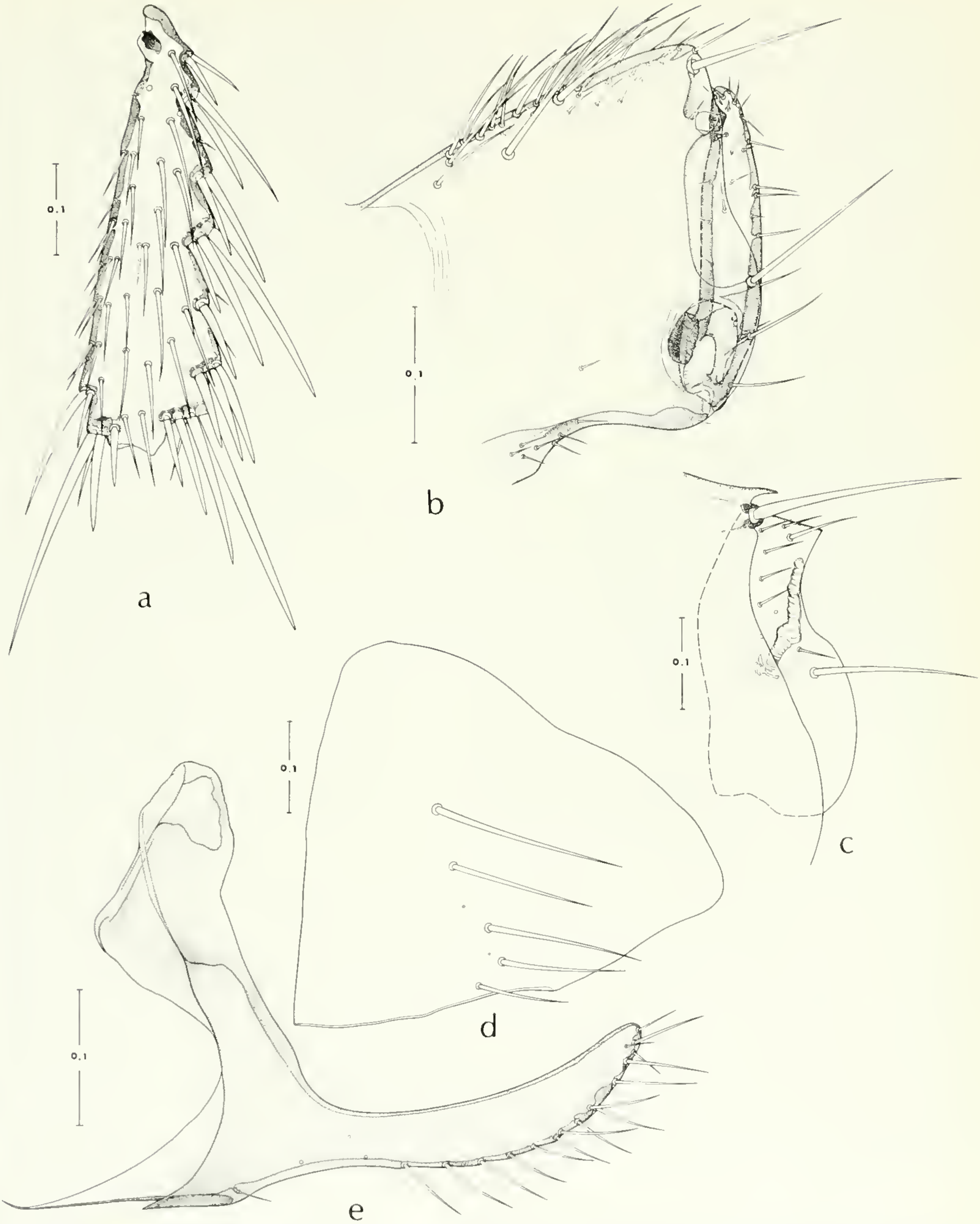


Fig. 23. *Polygenis roberti beebei* (I. Fox). Male. a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

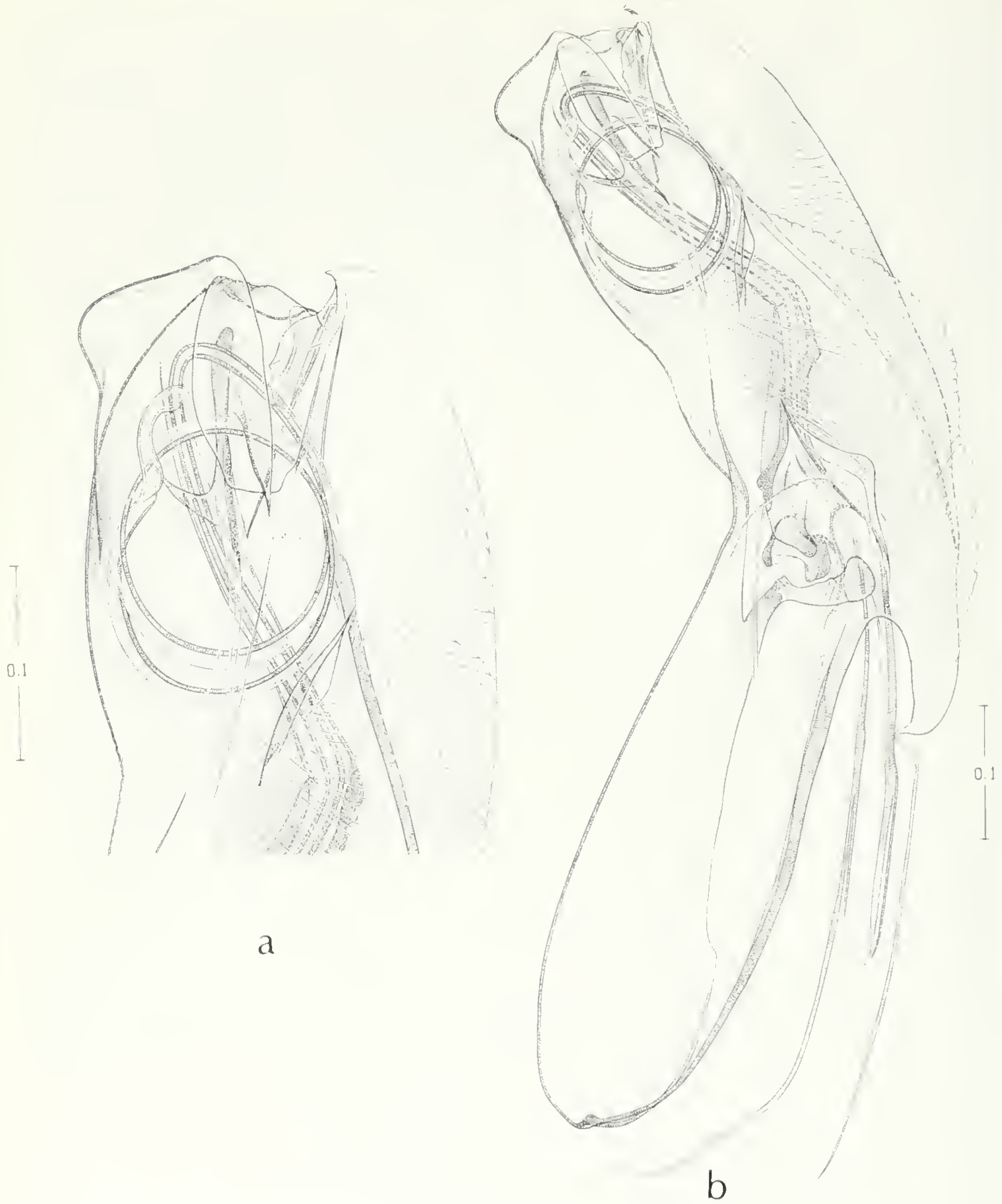


Fig. 24. *Polygenis roberti beebi* (I. Fox). Male: a, apex of aedeagus. b, aedeagus.

eus, Didelphis marsupialis caucae, Heteromys desmarestianus, Nectomys alfari, Oryzomys bombycinus, O. caliginosus chrysomelas, O. capito, Peromyscus nudipes nudipes, Zygodontomys brevicauda, and *Proechimys semispinosus panamensis.* Peru: ex *Dasypus novemcinctus, Oligoryzomys longicaudatus stolzmanni* (=*Oryzomys longicaudatus stolzmanni*), and *Oryzomys* (*Oryzomys*) *laticeps* (=*O. capito*) subspecies. Venezuela: ex *Didelphis m. marsupialis, Heteromys a. anomalus, Oryzomys fulvescens delicatus, Oecomys t. trinitus* (=*Oryzomys concolor trinitatis*), *Neacomys spinosus* subspecies (=*N. tenuipes*), *Akodon u. urichi, Sigmodon hispidus hirsutus, Rattus rattus frugivorus,* and *Mus musculus brevirostris.*

VENEZUELAN RECORDS (114 males and 152 females)

Of the 266 specimens collected, about 61% were ex *Oryzomys* species and 17% were associated with *Didelphis narasupialis.* There were 39 males and 50 females ex 35 *Oryzomys fulvescens,* all of which were collected in Monagas except one from Sucre; 16 males and 23 females ex 14 *O. albigularis* from Aragua; 8 males and 13 females ex 6 *O. concolor* from Monagas except 1 from Zulia; 1 male and 14 females ex 3 *O. capito* from Monagas and Yaracuy; 4 males and 9 females ex 3 *Nectomys squamipes* from Monagas and Zulia; 5 males and 5 females ex 7 *Rhipidomys macconnelli* from Bolivar; 7 males and 6 females ex 3 *Zygodontomys brevicauda* from Monagas; 25 males and 20 females ex 10 *Didelphis marsupialis* from Monagas except 1 from Bolivar and 1 from Yaracuy. Other hosts include *Nectomys alfari* (Monagas), *Rhipidomys venustus* (Monagas) *Akodon urichi* (Monagas), *Oryzomys minutus* (Mérida), *Mustela frenata* (Monagas), *Molossus ater*[3] (Monagas), and bird[4] (Mérida).

REMARKS

A large population (201 specimens) of *P. roberti beebei,* mostly ex *Oryzomys* species from Monagas, fit illustrations given by Traub and Johnson (1952). However, specimens from other localities and from other species of *Oryzomys* vary considerably in the number of notches in the hind tibia and in the number of spines in the penultimate notch of the hind tibia. In some specimens the bristles on the distal arm of the ninth sternum are longer and more numerous than in specimens from Monagas. The females of several species of *Polygenis* are morphologically similar and so it is difficult to insure that all of the females of this series are actually *P. roberti beebei.*

Polygenis versuta Guimarães
(Fig. 25, 26, 27, 28, 29a)

Polygenis versuta Guimarães, 1942:197, Fig. 1-3.

Polygenis platensis versutus, Johnson, 1957:167.

Polygenis versuta, Machado-Allison, 1962a:23-24, Fig. 1-3.

Type Data. Holotype female ex "rato do mato," Brazil: State of Bahía, Villa Nova, 1908, E. Garbe collector. Subsequent description of male based on male ex *Proechimys albispinus,* Brazil: State of Bahía: In addition, 10 males and 15 females with same data. One female ex *Rhipidomys cearanus* (=*R. mastacalis cearanus*), Brazil: State of Pernambuco. Other Recorded Distribution: None.

VENEZUELAN RECORDS (8 males and 15 females)

Nineteen specimens were collected ex 9 *Rhipidomys macconnelli* in Bolivar, and T. F. Amazonas. The remaining specimens (1 each) ex *Marmosa murina* in Bolívar, *Didelphis azarae* and *Akodon urichi* in T. F. Amazonas.

REMARKS

There are three distinct populations represented in our collections, all of them except 3 females were collected from *Rhipidomys macconnelli.* They may be subspecies of *P. versuta* or they may be undescribed species in the *occidentalis-peronis-versuta* complex. One male (SVP 8550) (Fig. 25-26) from Bolívar differs from males in the other two populations in that the distal arm of the ninth sternum is broad in the middle and has no setae on the proximal half, the movable process of the clasper is somewhat shorter and broader and the details of the aedeagus differ, principally the crochet. The second population of 2 males and 2 females (SVP 8049, 8869) (Fig. 27-28) from Bolívar is like the first male except the distal arm of the ninth sternum is not broad in the middle and it tapers from base to apex, the movable process of the clasper is long and narrow and again the details of the aedeagus differ. The third population, composed of 5 males and 12 females, is entirely from T. F. Amazonas and all ex *Rhipidomys macconnelli* except 3 females. In this population the distal arm of the ninth sternum is somewhat intermediate between the other two in shape but there are no bristles on the proximal half, the eighth sternum is much more rounded apically than in the other two groups, the movable process of the clasper is intermediate between the two groups, and again there are some differences in the details of the aedeagus.

Family Pygiopsyllidae

Genus *Ctenidiosomus* Jordan

Ctenidiosomus Jordan, 1931*a*:311

Type Species of genus: *Ctenidiosomus spillmanni* Jordan, 1931.

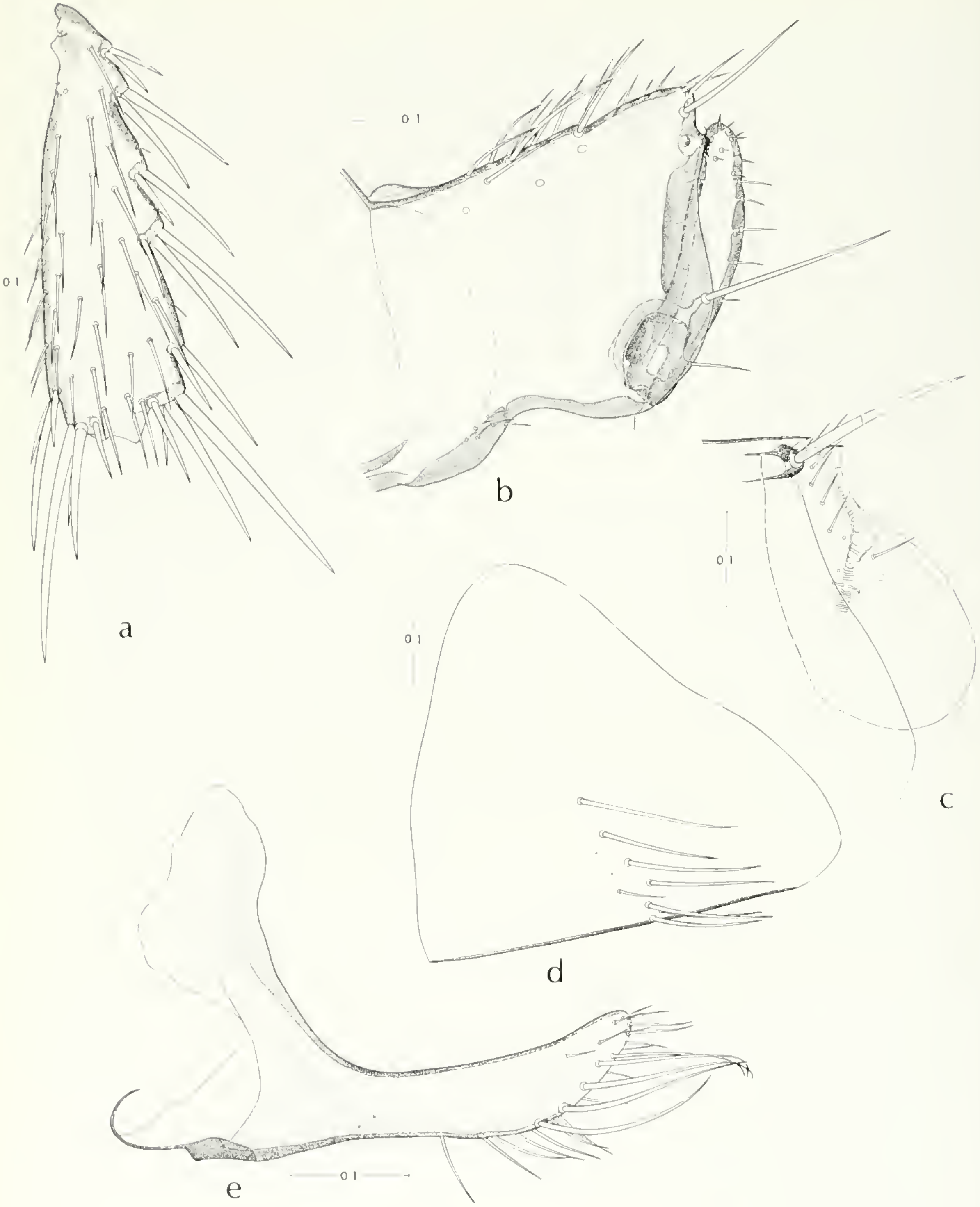


Fig. 25. *Polygenis versuta* Guimarães. Male (SVP 8850): a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

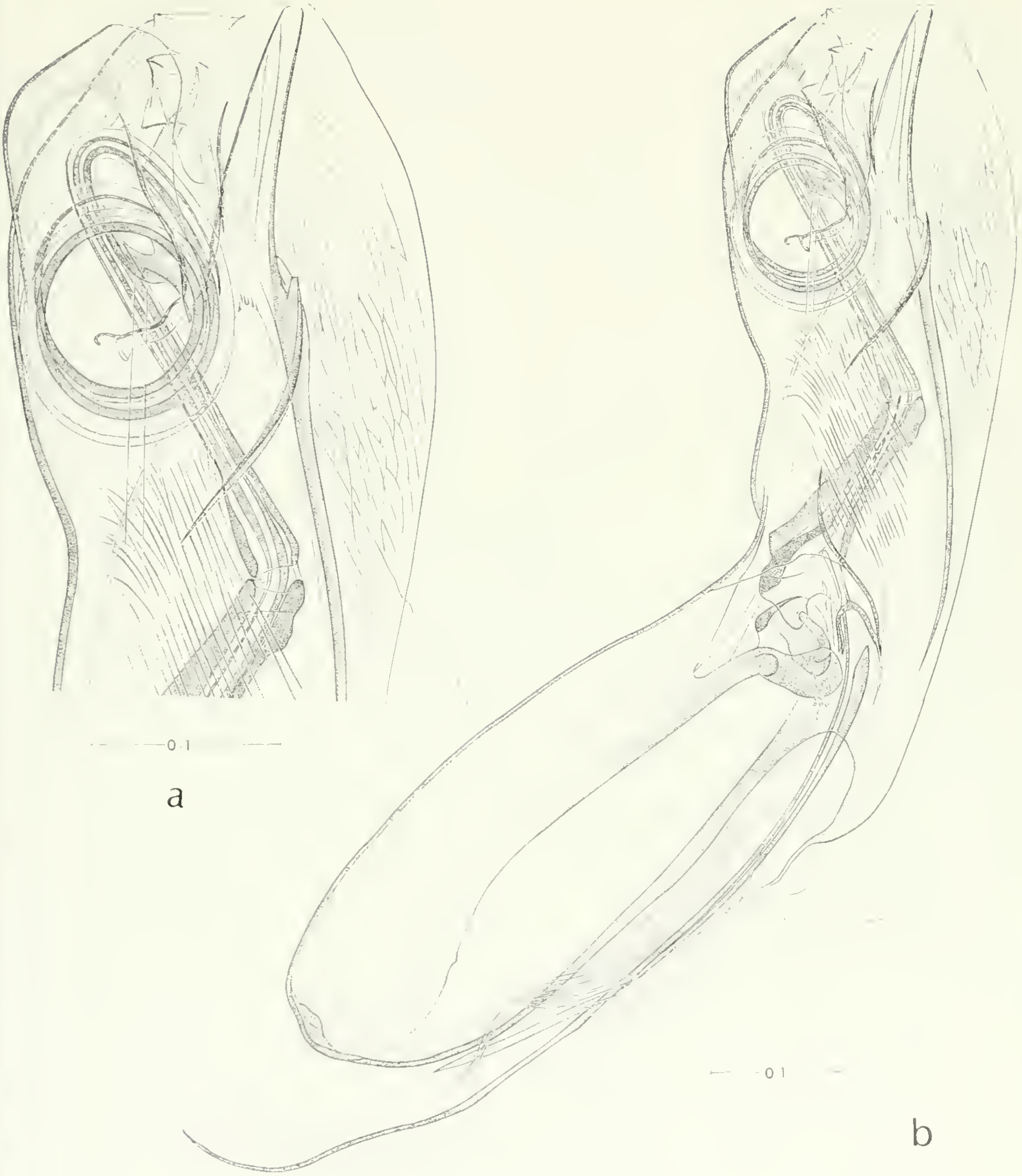


Fig. 26. *Polygenis versuta* Guimarães. Male (SVP 8550): a, apex of aedeagus. b, aedeagus.

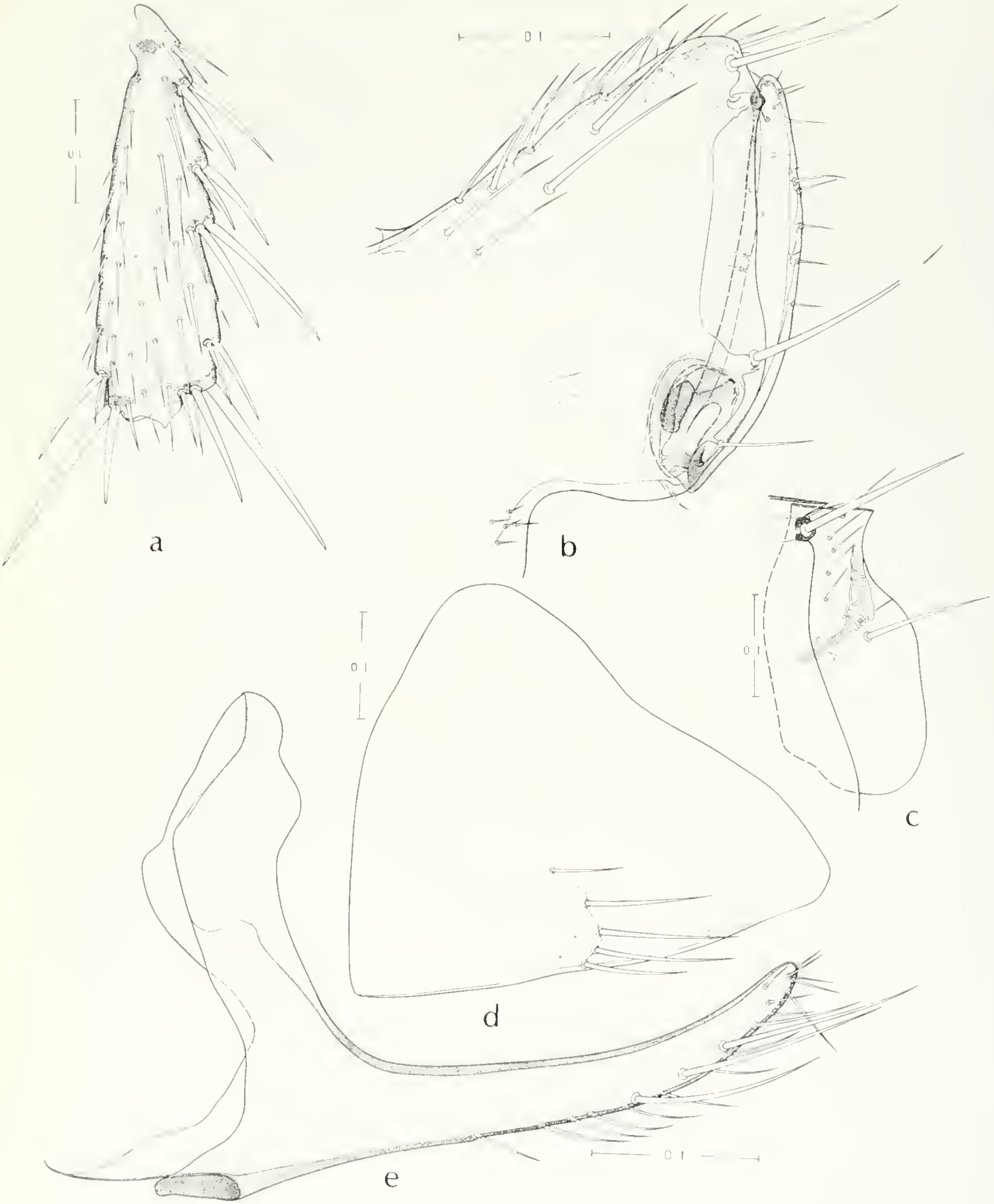


Fig. 27. *Polygenis versuta* Guimarães. Male (SVP 8669): a, metatibia. b, process and movable finger of clasper. c, seventh and eighth abdominal terga. d, eighth sternum. e, ninth sternum.

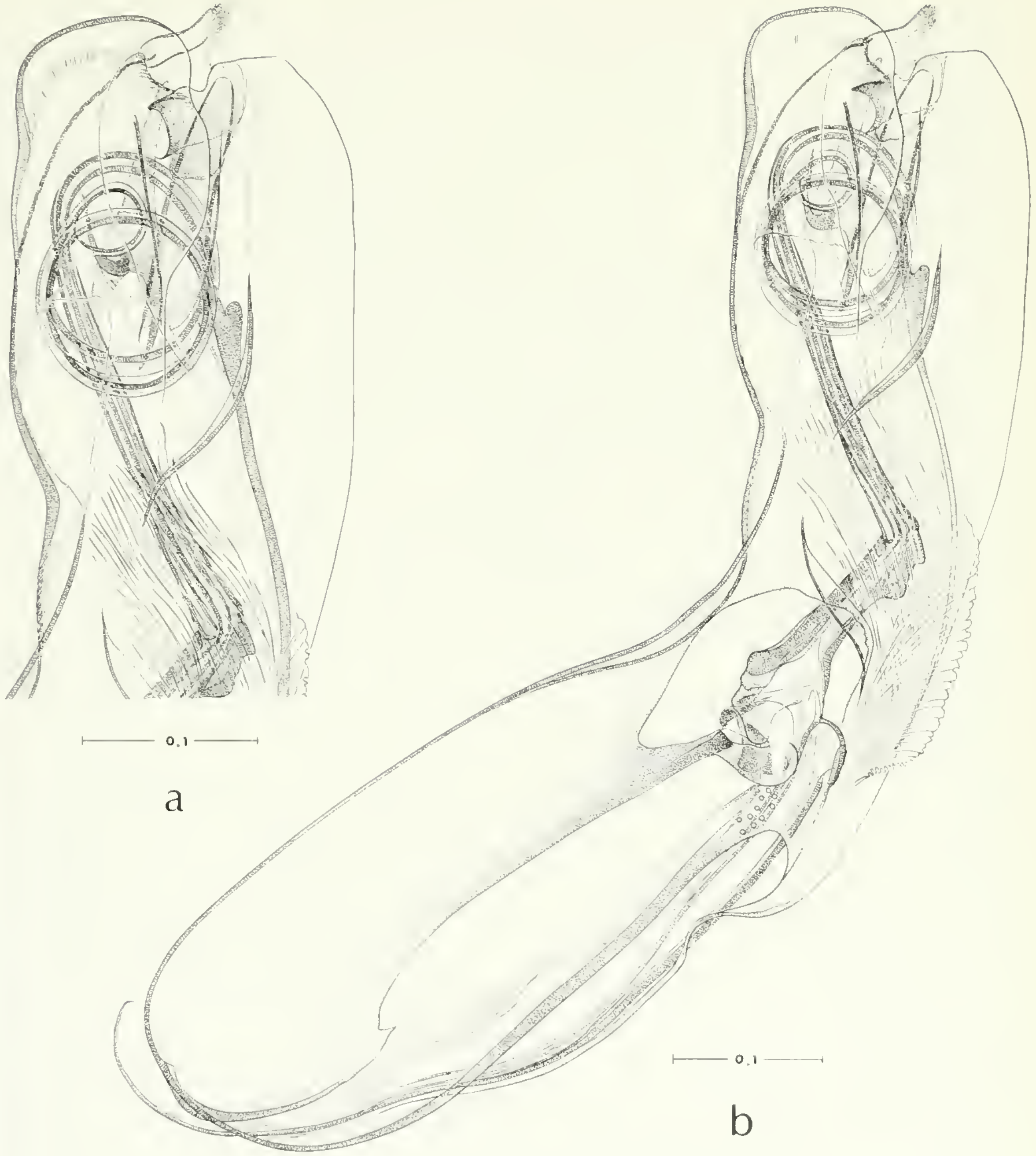


Fig. 28. *Polygenis versuta* Guimarães. Male (SVP 8669): a, apex of aedeagus. b, aedeagus.

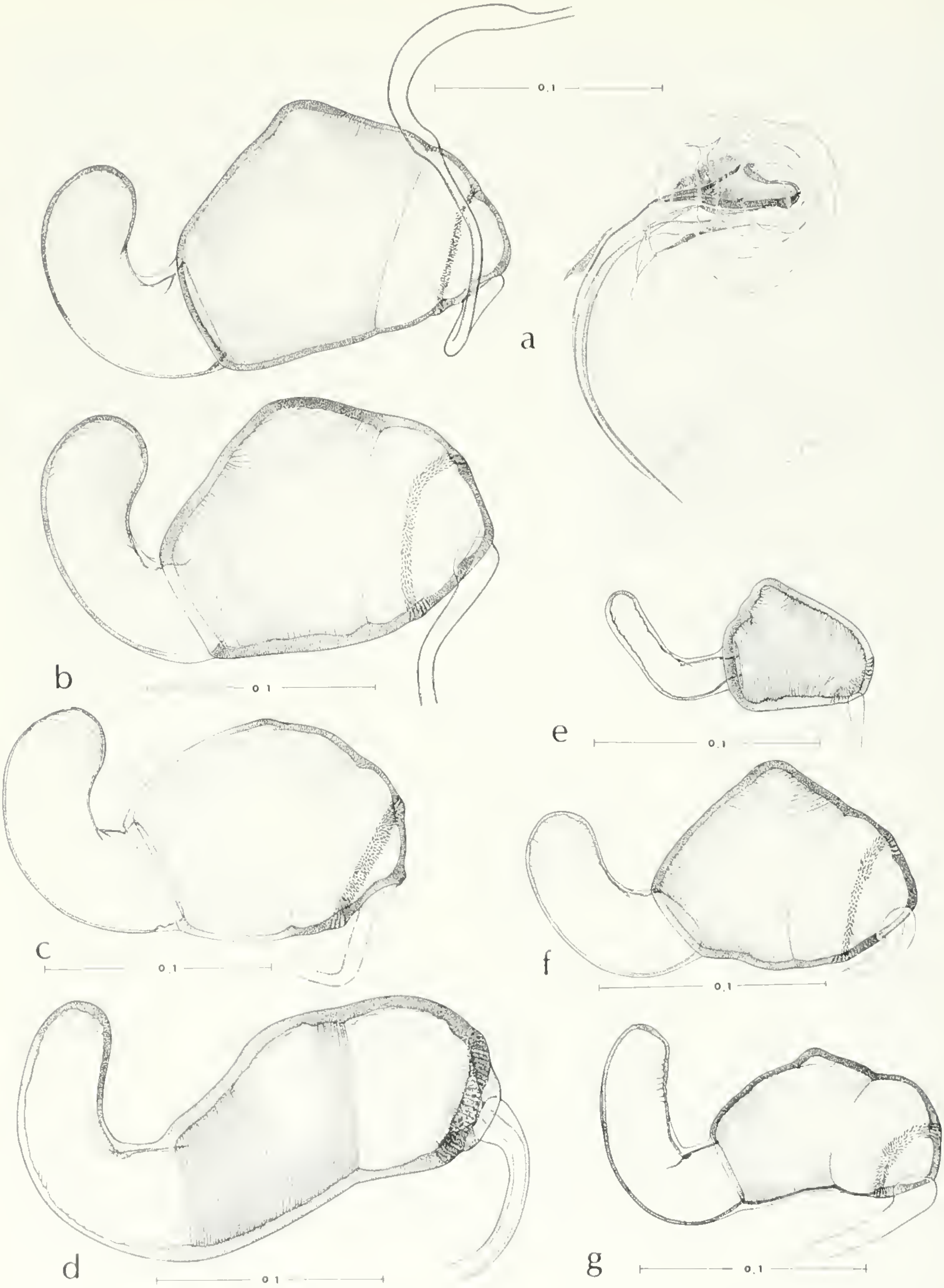


Fig. 29. Females: a *Polygenis versuta*, spermatheca and bursa copulatrix. Spermathecae of other *Polygenis* species and subspecies: b, *P. occidentalis steganus*. c, *P. roberti beebei*. d, *P. frustratus*. e, *P. klagesi samuelis*. f, *P. bohlsi bohlsi*. g, *P. peronis*.

Ctenidiosomus perplexus, new species

(Fig. 30-33)

DIAGNOSIS

Very near *Ctenidiosomus rex* Johnson, 1957, but may be separated from that species by a combination of the following characters. In the male the distal arm of the ninth sternum is subtruncate, not rounded, and more setose than in *C. rex*. The apex of the proximal arm of the ninth sternum is broadly triangular rather than fingerlike; the median dorsal lobe is shaped like the head of a bird as in *C. rex* but the beak is not so pointed; the crochet is curved dorsad rather than ventrad; the apex of the process of the clasper is globular not angular; the apex of the aedeagal apodeme is not curved dorsad so far is in *C. rex* and the penis rods are more highly coiled.

DESCRIPTION

Head (Fig. 30a): Fracticipit. Frontoclypeal margin evenly rounded. Preantennal area with three submarginal discs; micropunctations scattered over surface; first row of 6 medium bristles, first bristle displaced; second row of 3 long bristles which reach beyond caudoventral margin of gena; several small setae in ocular area. Caudoventral margin of gena concave, producing two lobes. Eye reduced, lightly pigmented. Occiput with two submarginal discs plus 1 lateral disc, micropunctations scattered over surface of anterior portion; 3 rows of bristles arranged 4(5)-5(6)-7; with additional very long bristle in caudoventral angle (bristles of first row broken off in male holotype); many small setae scattered along margin of antennal fossa.

Thorax (Fig. 30a, b): Pronotum with anterior row of 9 or 10 medium bristles; second row of about 9 longer bristles, with intercalaries between bases of bristles of second row. Pronotal comb of 13 or 14 spines per side; mesonotum with 3 more or less distinct rows of bristles with several small bristles anterad of these rows. Mesepisternum with 2 or 3 small bristles in posteroventral angle, 2 small bristles and 1 long bristle near ventral margin. Metanotum with 3 distinct rows of bristles caudad of several smaller bristles scattered over surface. Lateral metanotal area with single large apicodorsal bristle. Metepisternum with row of 5 bristles, middle 3 bristles long, dorsal-most bristle small, ventral bristle of medium length. Metepimere with 2 rows of bristles, first row of 6 medium bristles plus smaller displaced bristle dorsad of row, small bristle between first and second bristles; second row of 8 or 9 bristles, interspersed with 3 to 4 smaller bristles.

Legs: Mesocoxa with external swordlike ridge extending ventrad to external oblique break. Metatibia with bristles in dorsal notches from base to apex as follows: 2-2-2-2-2-2-4-3.

Abdomen: Female with well-developed combs on terga II to VI (1 female with combs on terga II to VII); number of teeth in each comb highly variable but most frequently 15-14-14(15)-11(12)-8. Male with combs on terga II to V. Two large antepygidial bristles, ventral bristle longer than dorsal bristle; in female 2 large bristles ventrad of antepygidial bristles.

Modified Abdominal Segments, Male (Fig. 31): Eighth sternum with caudal margin subtruncate; 6 to 8 large, dark submarginal bristles plus several additional submarginal and lateral bristles. Manubrium with base hamlike, apex fingerlike. Immovable process of clasper with sinus in caudodorsal margin; anterior lobe with parallel sides, apex rounded; with 3 long lateral bristles plus several smaller marginal and submarginal bristles; caudal lobe with evenly rounded posterior margin bearing 4 stout evenly spaced bristles. Movable process of clasper with subparallel sides gradually tapering to subacuminate apex; 2 long subapical bristles on posterior margin; several smaller bristles ventrad of two larger bristles; lateral vertical row of 5 or 6 smaller bristles; several small lateral and submarginal bristles on anterodorsal portion. Proximal arm of ninth sternum swollen subapically, apex triangular. Distal arm of ninth sternum with subparallel sides but with apex slightly wider than base; apex subtruncate; caudal margin with 4 strong dark bristles, 2 on apex close together, others more widely separated; with numerous additional smaller marginal, submarginal and lateral bristles primarily on caudal half of distal arm of ninth sternum.

Aedeagus (Fig. 32): Aedeagal apodeme long and narrow, apex acuminate, slightly upturned. Median dorsal lobe evenly rounded dorsally, with apicocaudal projection beaklike. Lateral lobes striate to reticulate; apex subtruncate to subacuminate. Crochets narrow, curved dorsad. Aedeagal apodemal rod extends beyond apex of apodeme but not coiled. Penis rods highly coiled, fimbriate for almost entire length.

Modified Abdominal Segments, Female: Seventh sternum with prominent narrow sinus dividing caudal margin into 2 subequal lobes. Eighth tergum with 11-15 bristles proximad of these; margin well sclertoized. Anal stylet 6 times longer than wide. Spermatheca with no line of demarcation between bulga and hilla; bulga ovoid, reticulate.

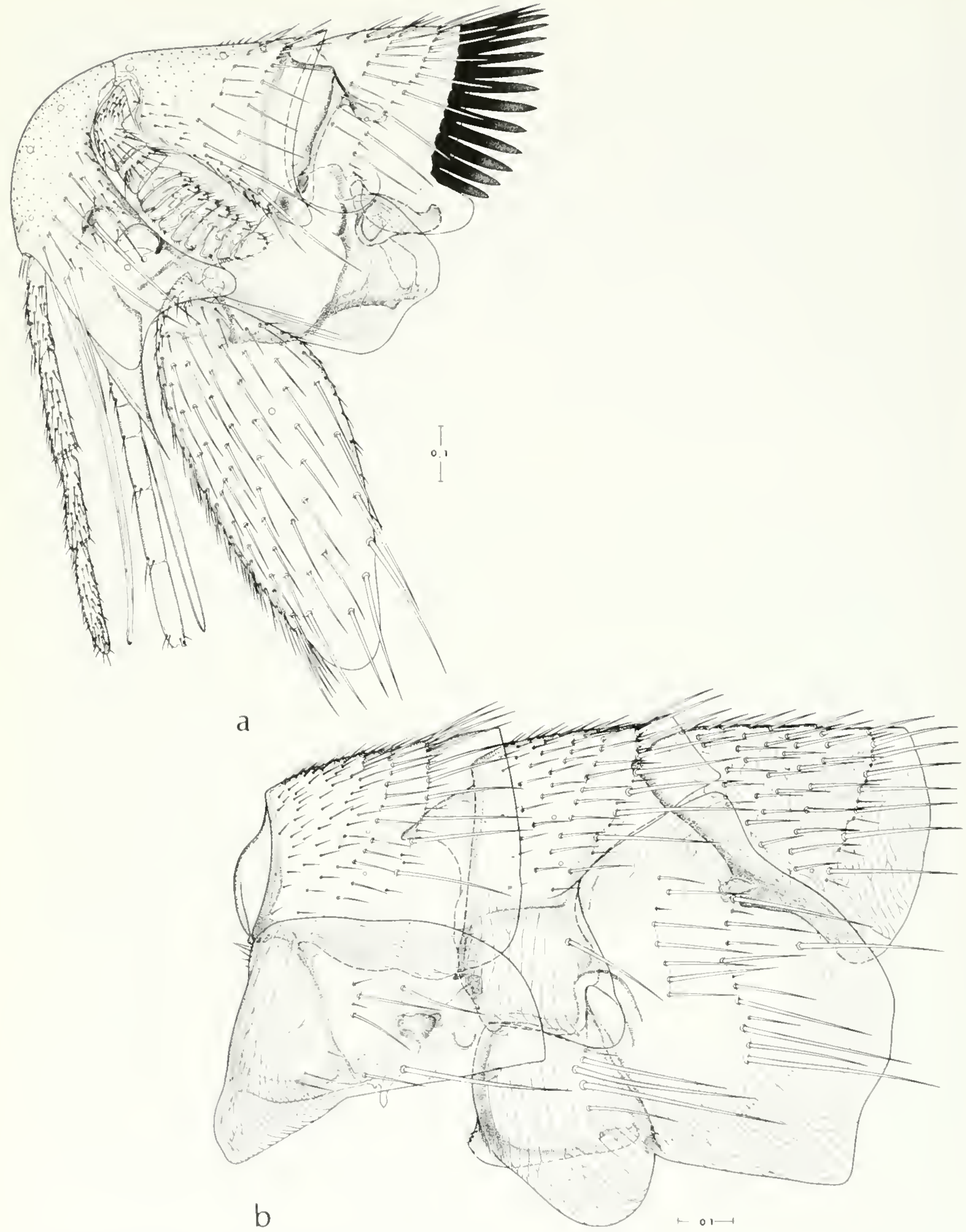


Fig. 30. *Ctenidiosomus perplexus*, new species. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

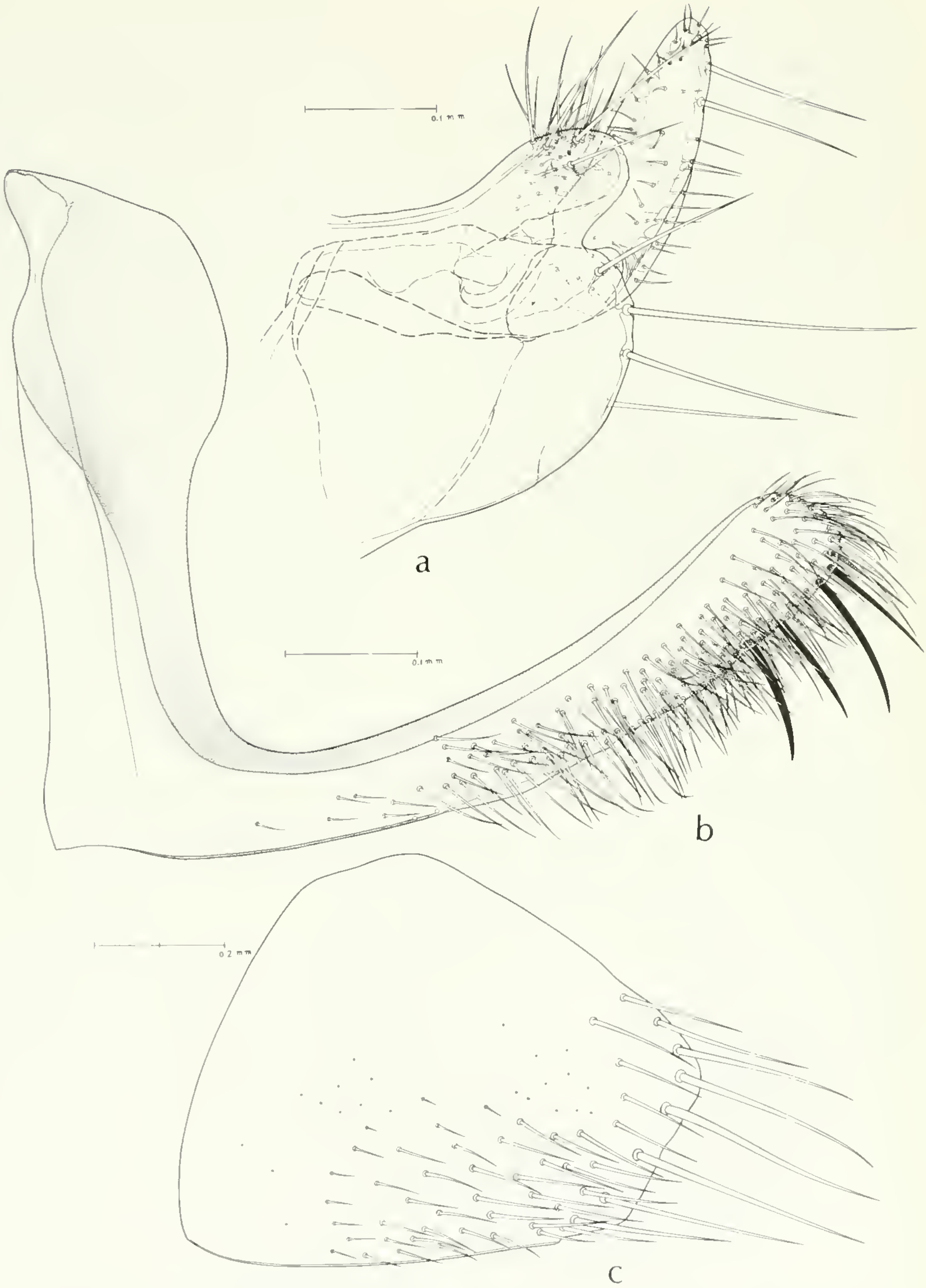


Fig. 31. *Ctenidiosomus perplexus*, new species. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

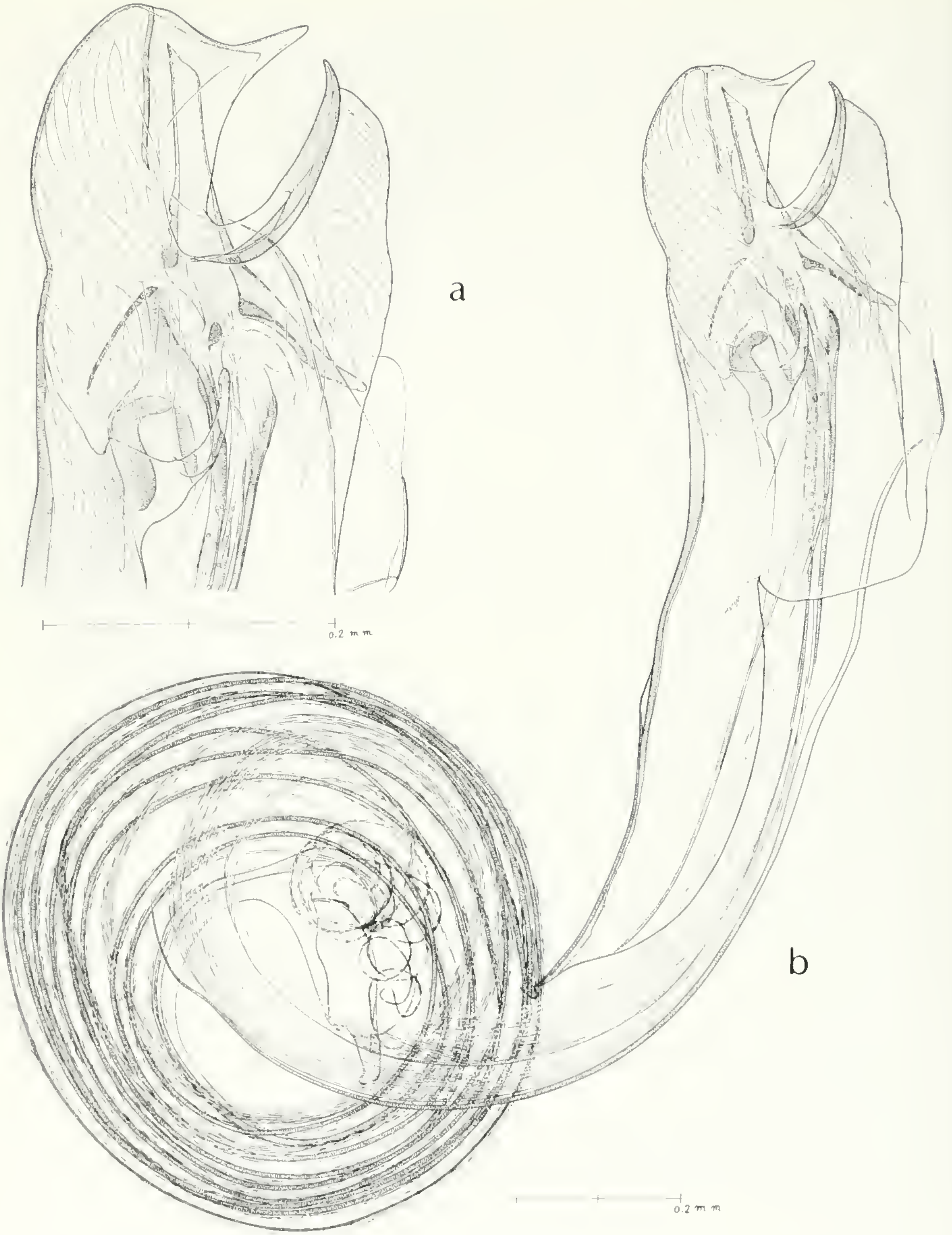


Fig. 32. *Ctenidiosomus perplexus*, new species. Male: a, apex of aedeagus. b, aedeagus.

Type Data: Male holotype and female allotype ex *Rhipidomys venustus* (SVP 3885), Venezuela: Trujillo, 14 km E Trujillo near Misisí, 2210 m elev., 26-I-1966, Peterson team collectors. One paratype male with same data as holotype. Ten paratype males and 10 paratype females with data given in Table 4. Male holotype and female allotype deposited in the collection of the U.S. National Museum. One male and 1 female paratype deposited in each of the following collections: British Museum, Robert Traub, the senior and junior authors.

Family Hystrichopsyllidae

Genus *Adoratopsylla* Ewing

Adoratopsylla Ewing, 1925:44.

Type Species: *Adoratopsylla bisetosa* Ewing.

Adoratopsylla (*Adoratopsylla*) *antiquorum antiquorum* (Rothschild)

Ctenophthalmus antiquorum Rothschild, 1904: 643-645, Pl. 14, Fig. 72; Pl. 15, Fig. 80, 82.

Adoratopsylla antiquorum, Ewing, 1925:44.

Adoratopsylla antiquorum antiquorum, Jordan, 1938*b*:165, Fig. 109, 110.—Costa Lima and Hathaway, 1946:228.—Guimarães, 1954:510, 512, 513.—Johnson, 1957:31, Pl. 13, Pl. 14, Fig. 1, 2, 3.—Barrera and Diaz-Ungria, 1957: 165, 178. — Machado-Allison, 1963:270-271.—1964:158-167.—1966:24.

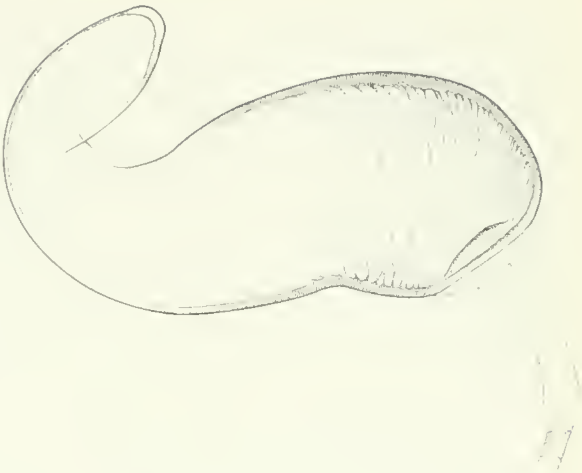


Fig. 33. *Ctenidiosomus perplexus*, new species. Female: spermatheca.

Type Data: Three males and 1 female ex *Didelphis aurita* (=*Didelphis marsupialis aurita*), Brazil: Tigneti Zech, 1897, Ihering collector.

Other Recorded Distribution: Brazil ex *Didelphis marsupialis aurita*, *Marmosa* species, *Monodelphis domestica*, *Peramys dimidiata* (=*Monodelphis dimidiata*). Venezuela: *Monodelphis brevicaudata*.

Remarks

Adoratopsylla antiquorum antiquorum (Rothschild) has been recorded from Venezuela by Barrera and Diaz-Ungria (1957) and Machado-Allison (1964). It is our opinion that this subspecies has not been collected in Venezuela and that specimens heretofore called *A. antiquorum antiquorum* are actually *A. antiquorum*

Table 4 Host and Locality Data for Type Specimens of *Ctenidiosomus perplexus*, New Species.

Males	Females	SVP Number	Host	Locality	Elevation in meters
1		3839	*Thomasomys laniger*	Trujillo: Hda. Misisí	2210
	1	3857	*Rhipidomys venustus*	Trujillo: Hda. Misisi	2210
1	1	3874	*Thomasomys laniger*	Trujillo: Hda. Misisi	2360
1		3876	*Thomasomys laniger*	Trujillo: Hda. Misisi	2360
1		3882	*Rhipidomys venustus*	Trujillo: Hda. Misisí	2210
2	1	3885	*Rhipidomys venustus*	Trujillo: Hda. Misisí	2210
	1	3890	*Rhipidomys venustus*	Trujillo: Hda. Misisi	2210
1		4044	*Thomasomys laniger*	Mérida: La Coromoto	3170
1		4370	*Rhipidomys venustus*	Mérida: nr Middle Refugio	2550
1		4553	*Thomasomys lugens*	Mérida nr. Santa Rosa	2040
	1	21832	*Thomasomys hylophilus*	Táchira: Buena Vista	2395
	1	21844	*Thomasomys hylophilus*	Táchira: Buena Vista	2390
	1	21873	*Thomasomys hylophilus*	Táchira: Buena Vista	2400
1		21880	*Thomasomys hylophilus*	Táchira: Buena Vista	2405
	2	21928	*Oryzomys albigularis*	Táchira: Buena Vista	2415
	1	21935	*Thomasomys hylophilus*	Táchira: Buena Vista	2400
1		21954	*Thomasomys hylophilus*	Táchira: Buena Vista	2400
	1	21973	*Anotomys trichotis*	Táchira: Buena Vista	2400
1		21994	*Oryzomys minutus*	Táchira: Buena Vista	2400

discreta. Hopkins and Rothschild (1957) refer to an undescribed subspecies of *A. antiquorum* from Venezuela in their key to species and subspecies of the subgenus *Adoratopsylla*. Some records of *A. antiquorum antiquorum* may be this subspecies. We have a series of specimens, most of which are from Falcón, which key out to the undescribed species. A description of this subspecies is given below. Two additional male specimens, unlike any other population of *A. antiquorum*, are also described below. We have described only the modified abdominal segments since characters of the head and thorax are similar in all subspecies of *A. antiquorum*.

Adoratopsylla (*Adoratopsylla*) *antiquorum discreta* (Jordan)

(Fig. 34-36)

Doratopsylla antiquorum discreta Jordan, 1926: 392, Fig. 18.

Adoratopsylla antiquorum discreta, Jordan, 1938*b*:165.—Guimarães, 1954:513. — Johnson, 1957:31.

Type Data: Male holotype and male paratype ex *Peramys adustus* (=*Monodelphis adusta*); Colombia: Cundinamarca, 1912.

Other Recorded Distribution: None.

Description

Female (Fig. 35d). *Modified Abdominal Segments*: Seventh sternum with sinus in caudal margin broadly v-shaped. Spermatheca with portion of bulga nearest hilla narrowest, striated; hilla short, broad, without striations; duct of spermatheca convoluted; bursa copulatrix well defined, perula dipperlike.

Venezuelan Records (32 males and 40 females)

There were 66 specimens ex 7 *Monodelphis brevicaudata* in Gúarico and Barinas, and 2 female specimens ex *Akodon urichi* in T. F. Amazonas. The remaining 4 specimens were from *Proechimys guyannensis*, *Didelphis azarae* and *Rhipidomys macconnelli* in T. F. Amazonas and *Sigmodon hispidus* in Barinas.

Adoratopsylla (*Adoratopsylla*) *antiquorum rara*, new subspecies

(Fig. 37-39)

Diagnosis

Adoratopsylla antiquorum rara is distinct from other subspecies in that there is a broad deep sinus in the apicodorsal margin of the process of the clasper, producing 2 prominent lobes and the hood of the aedeagus is broadly rounded apically.

Description

Male (Fig. 38). *Modified Abdominal Segments*: Eighth sternum with slightly sinuate caudal margin; patch of 5 setae near ventral margin, 2 caudal-most setae largest. Distal arm of the ninth sternum with sides parallel, 3-4 apical setae, proximal arm longer than distal arm, with margin sinuate. Immovable process of clasper divided into 2 prominent lobes by broad deep sinus in apicodorsal margin; lobe 1 with 2 strong apical setae plus 3 smaller subapical setae; lobe 2 thumblike, void of setae. Movable process of clasper broad, widest at middle, reaches for half its length beyond apices of lobes of immovable process, 2 prominent setae on caudal margin near middle, 4 or 5 small setae near anterior margin plus 2 or 3 small subapical setae.

Aedeagus (Fig. 39): Aedeagal apodeme broad, apex rounded; penis rods longer than aedeagal apodeme but not coiled. Apex of hood of aedeagus broadly rounded. Crochet angular, well sclerotized.

Type Data: Male holotype ex *Marmosa murina* (SVP 8958), Venezuela: Bolívar, 59 km SE El Dorado, 1032 m elev., 2-VI-1966, Tuttle team collectors. One male paratype with same data as above.

Adoratopsylla (*Adoratopsylla*) *antiquorum recta*, new subspecies

(Fig. 40-42)

Diagnosis

Adoratopsylla antiquorum recta, new subspecies, may be distinguished from other subspecies of *A. antiquorum* in that the apicodorsal margin of the process of the clasper is straight whereas other subspecies have a definite sinus in this margin. The hood of the aedeagus is straight and fingerlike while the apex is somewhat beaklike in *A. a. discreta* and the hood is very broad and the apex rounded in *A. a. rara*, new subspecies.

Description

Male (Fig. 41a, b, c). *Modified Abdominal Segments*: Eighth sternum with caudal margin essentially straight, with one small seta, one medium seta near ventral margin plus one large medial seta. Distal arm of ninth sternum narrow in middle, slightly swollen apex with 3 setae. Immovable process of clasper with apicodorsal margin straight, with one large apical seta plus similar subapical seta, two smaller subapical setae, 4 or 5 minute setae in caudoventral angle. Movable process of clasper broadest near middle, two marginal setae slightly below middle, apex subacuminate, several small subapical setae plus 2 similar medial setae.

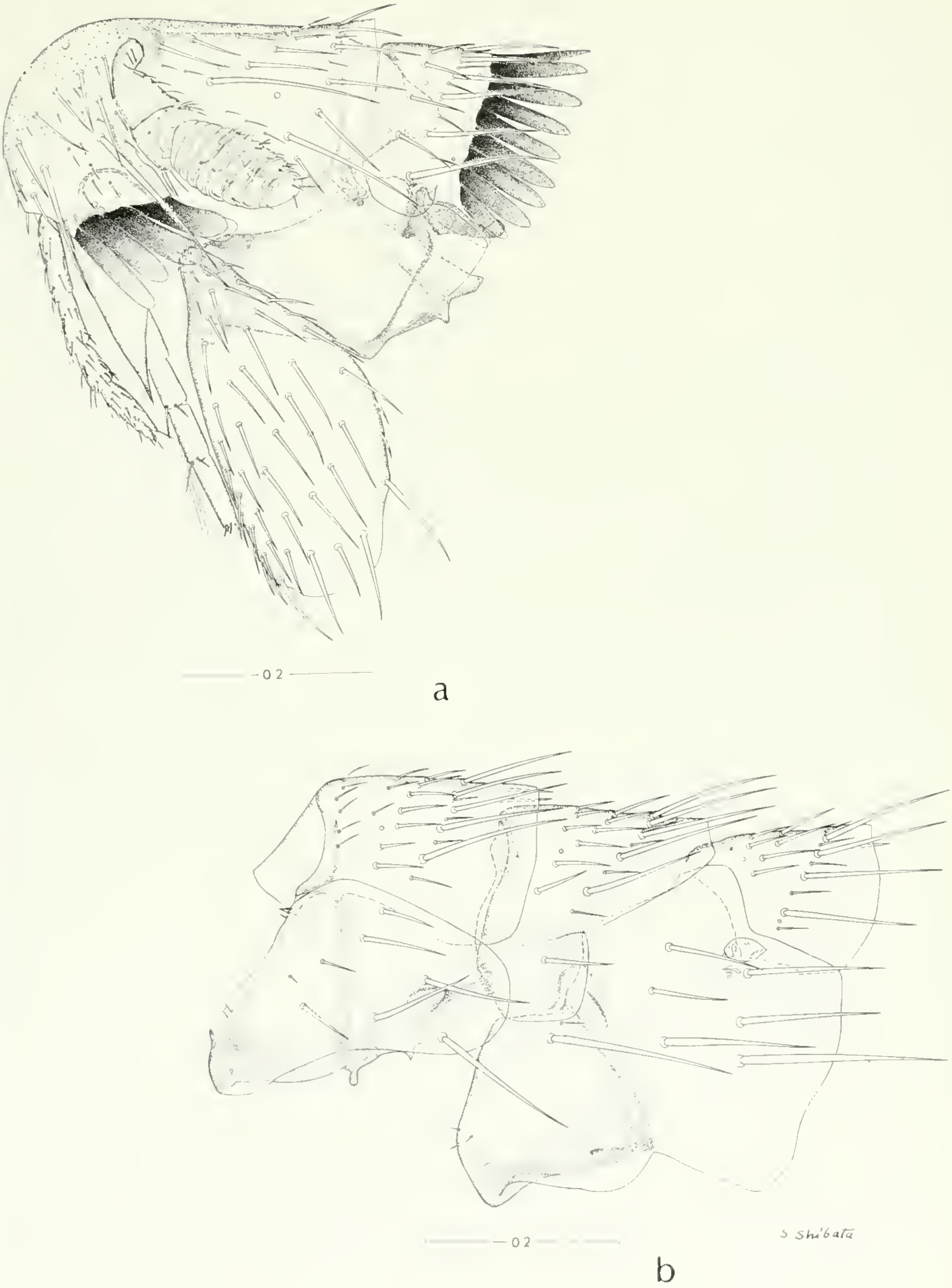


Fig. 34. *Adoratopsylla antiquorum discreta* (Jordan). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

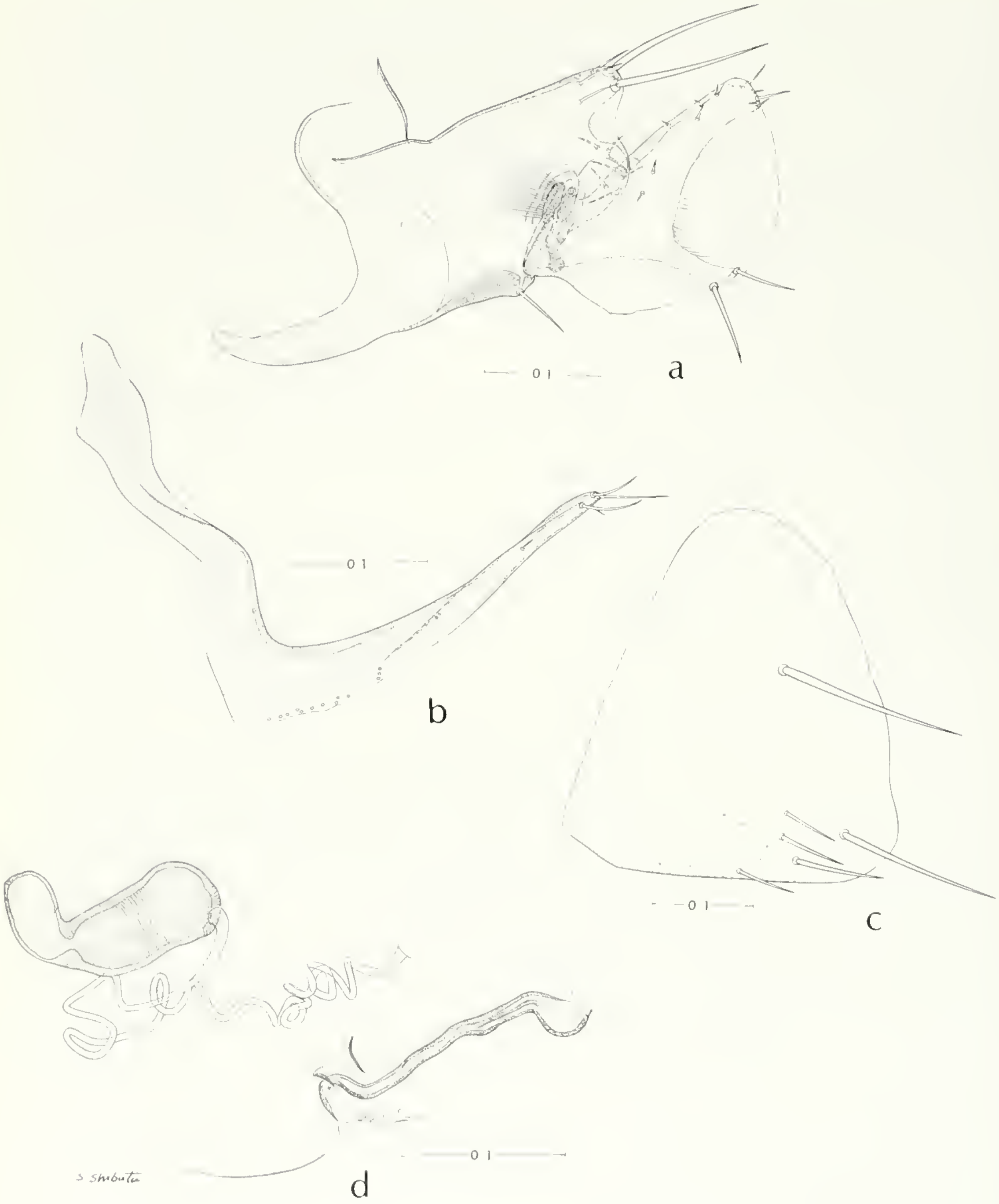


Fig. 35. *Adoratopsylla antiquorum discreta* (Jordan). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. Female: d, spermatheca, duct of spermatheca and bursa copulatrix.

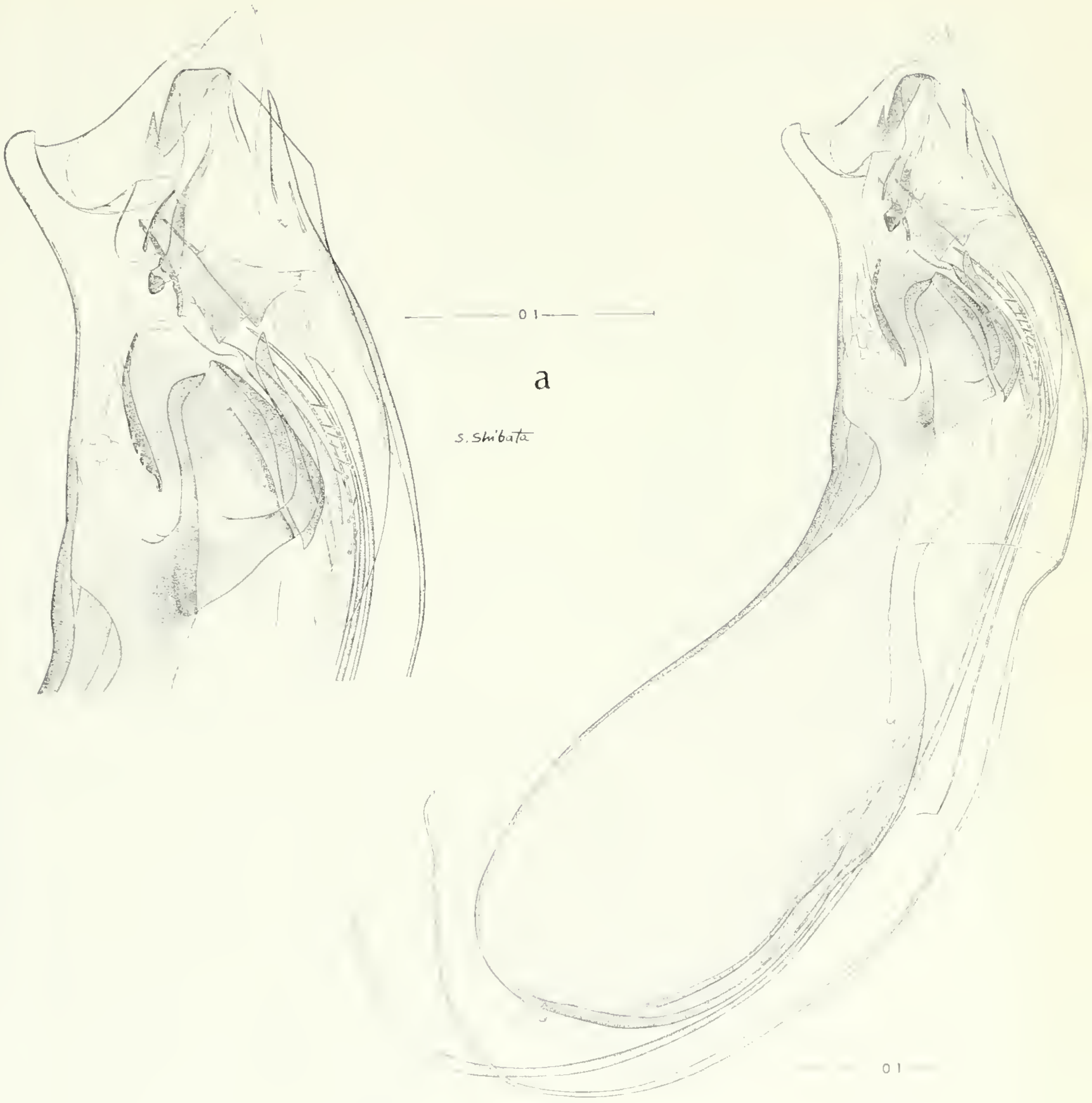

0.1
a
S. Shibata
0.1
b

Fig. 36. *Adoratopsylla antiquorum discreta* (Jordan). Male: a, apex of aedeagus. b, aedeagus.

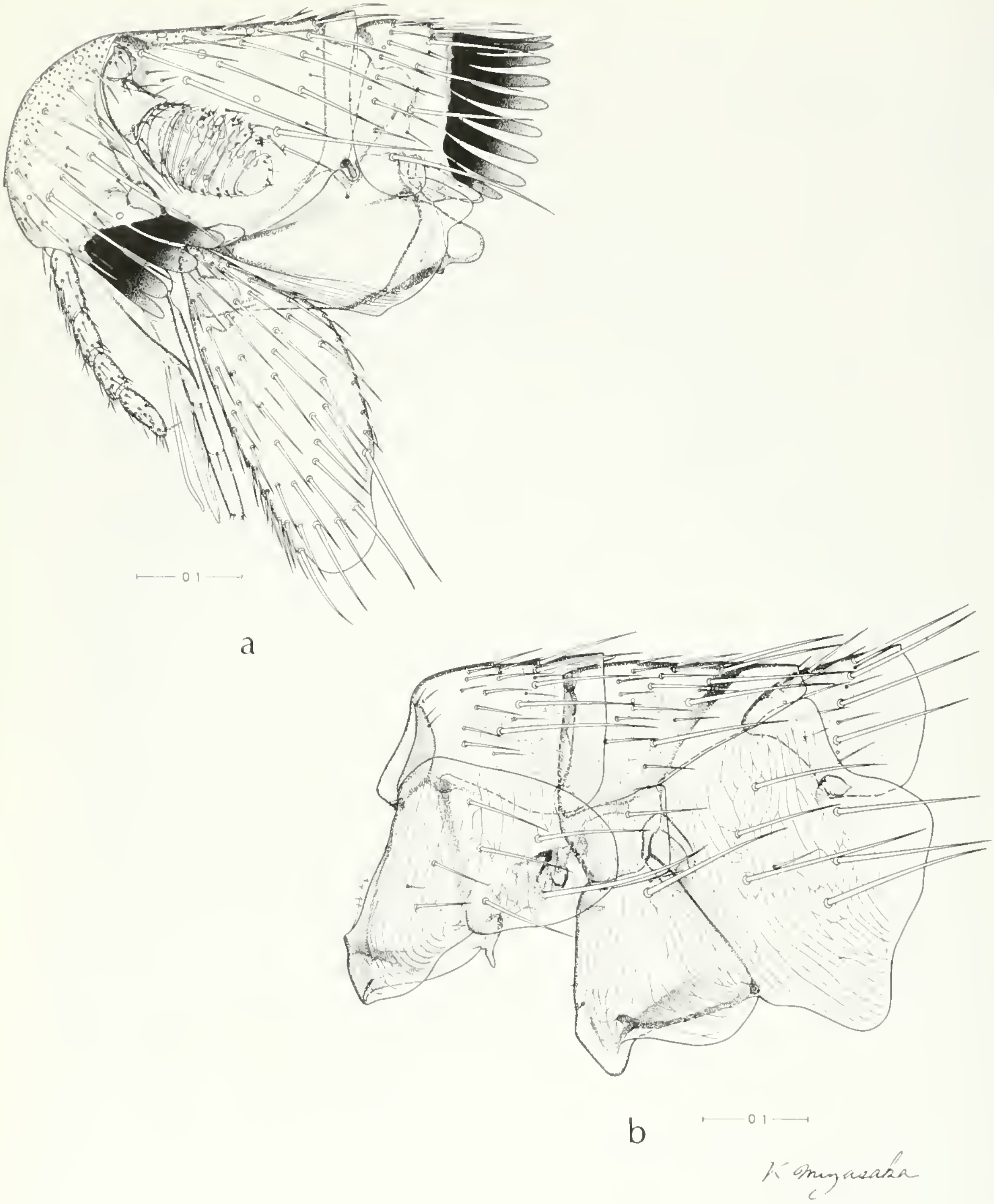


Fig. 37. *Adoratopsylla antiquorum rara,* new subspecies. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

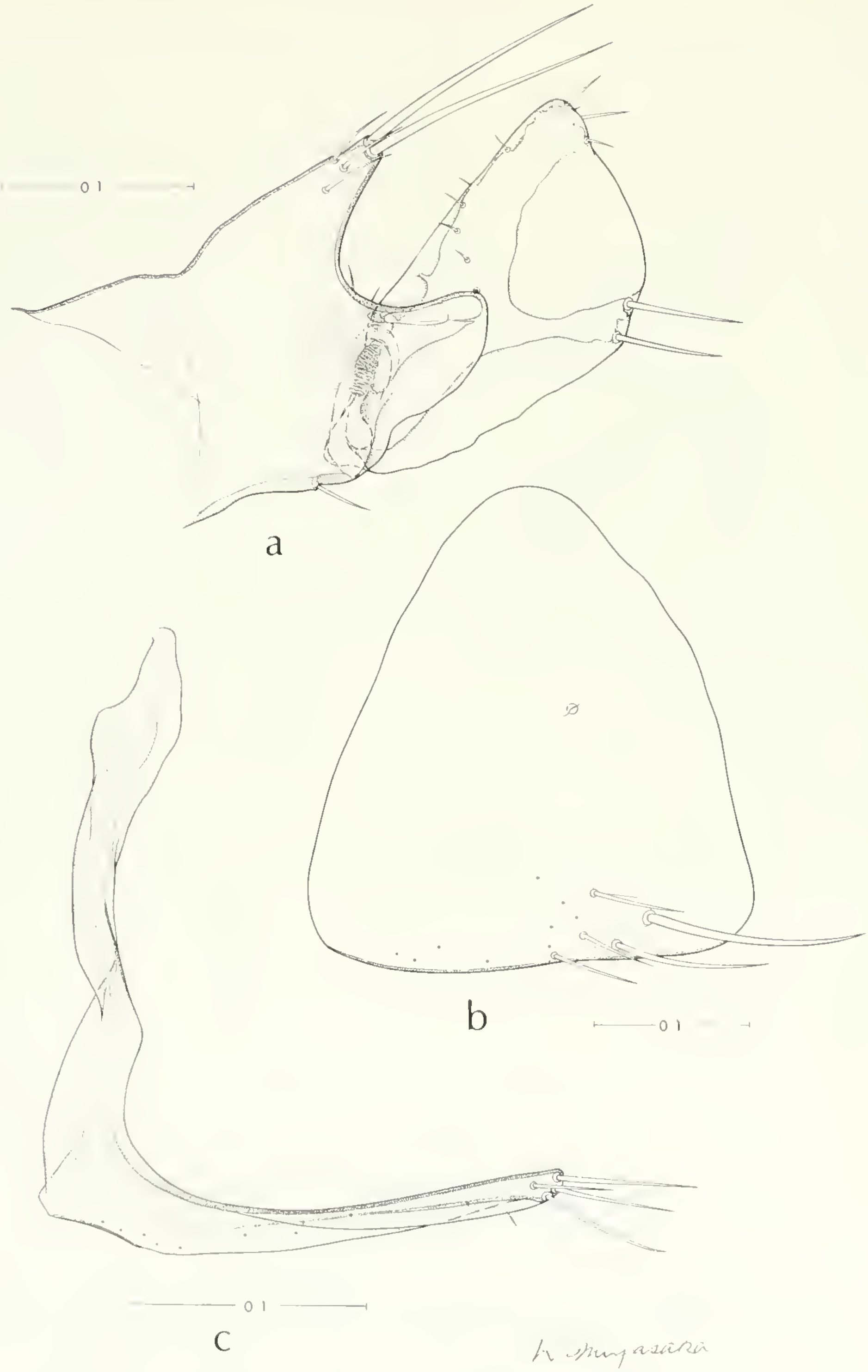


Fig. 38. *Adoratopsylla antiquorum rara*, new subspecies. Male: a, process and movable finger of clasper. b, eighth sternum. c, ninth sternum.

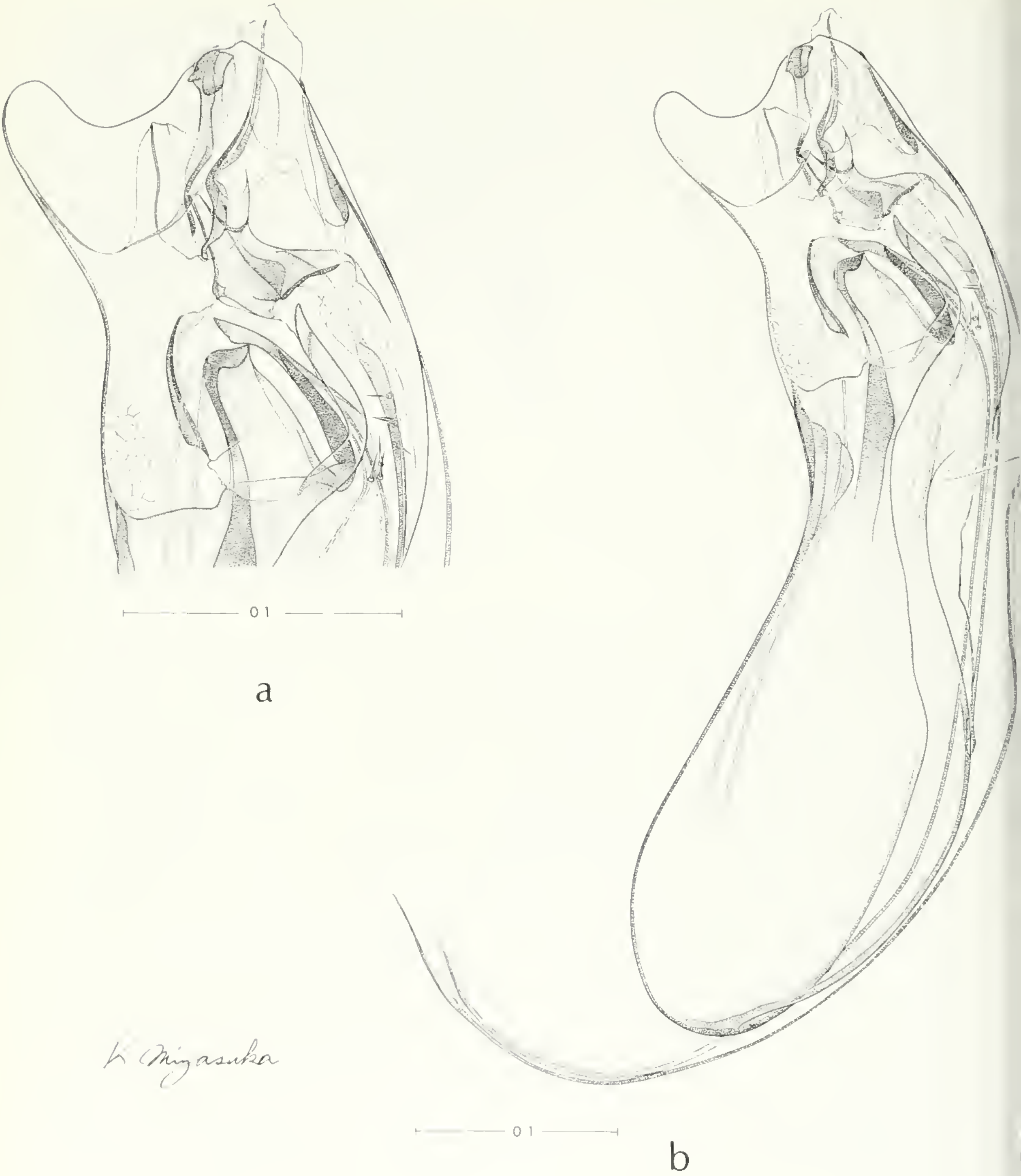

0 1
a
K Miyasaka
0 1
b

Fig. 39. *Adoratopsylla antiquorum rara,* new subspecies. Male: a, apex of aedeagus, b, aedeagus.

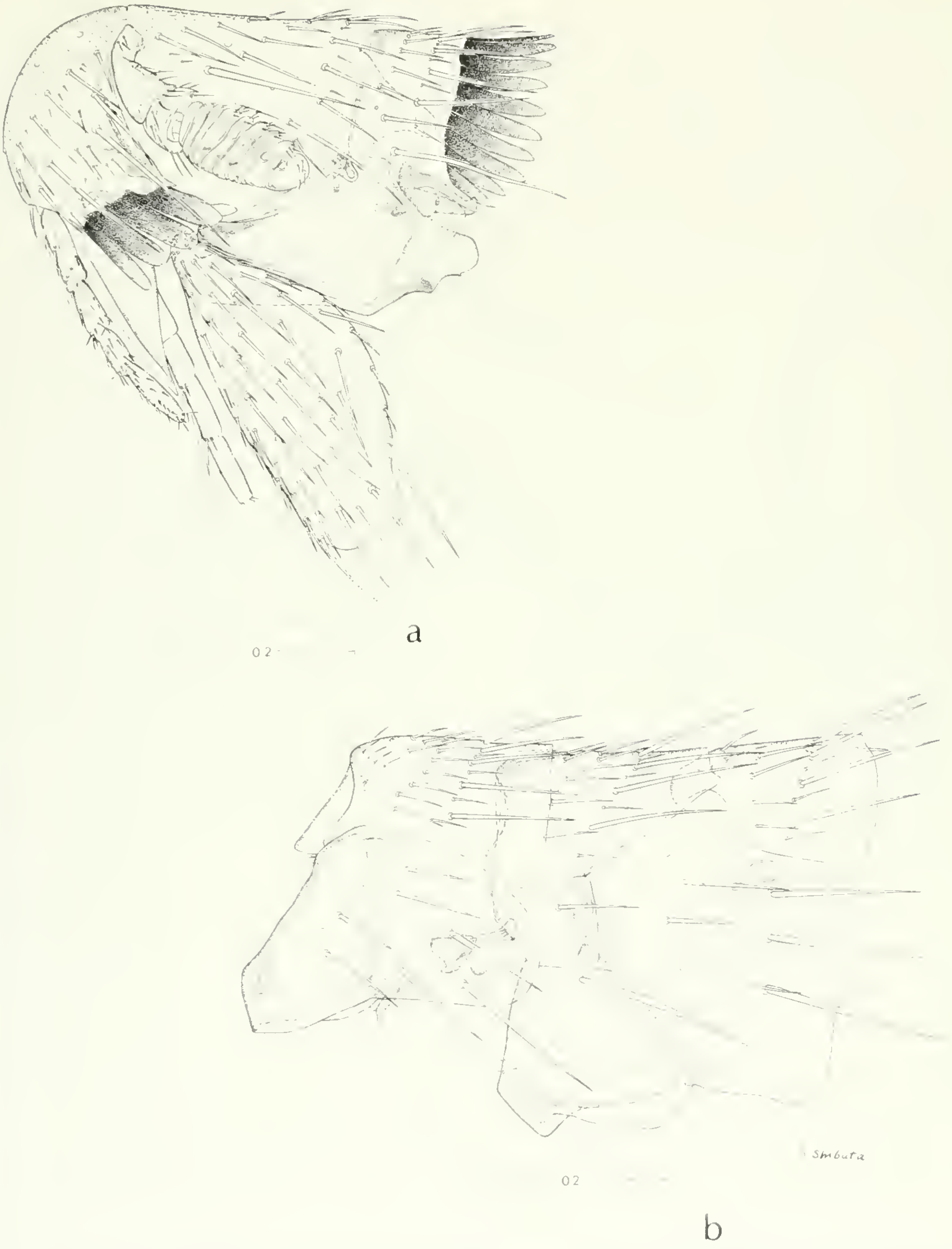


Fig. 40. *Adoratopsylla antiquorum reeta,* new subspecies. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

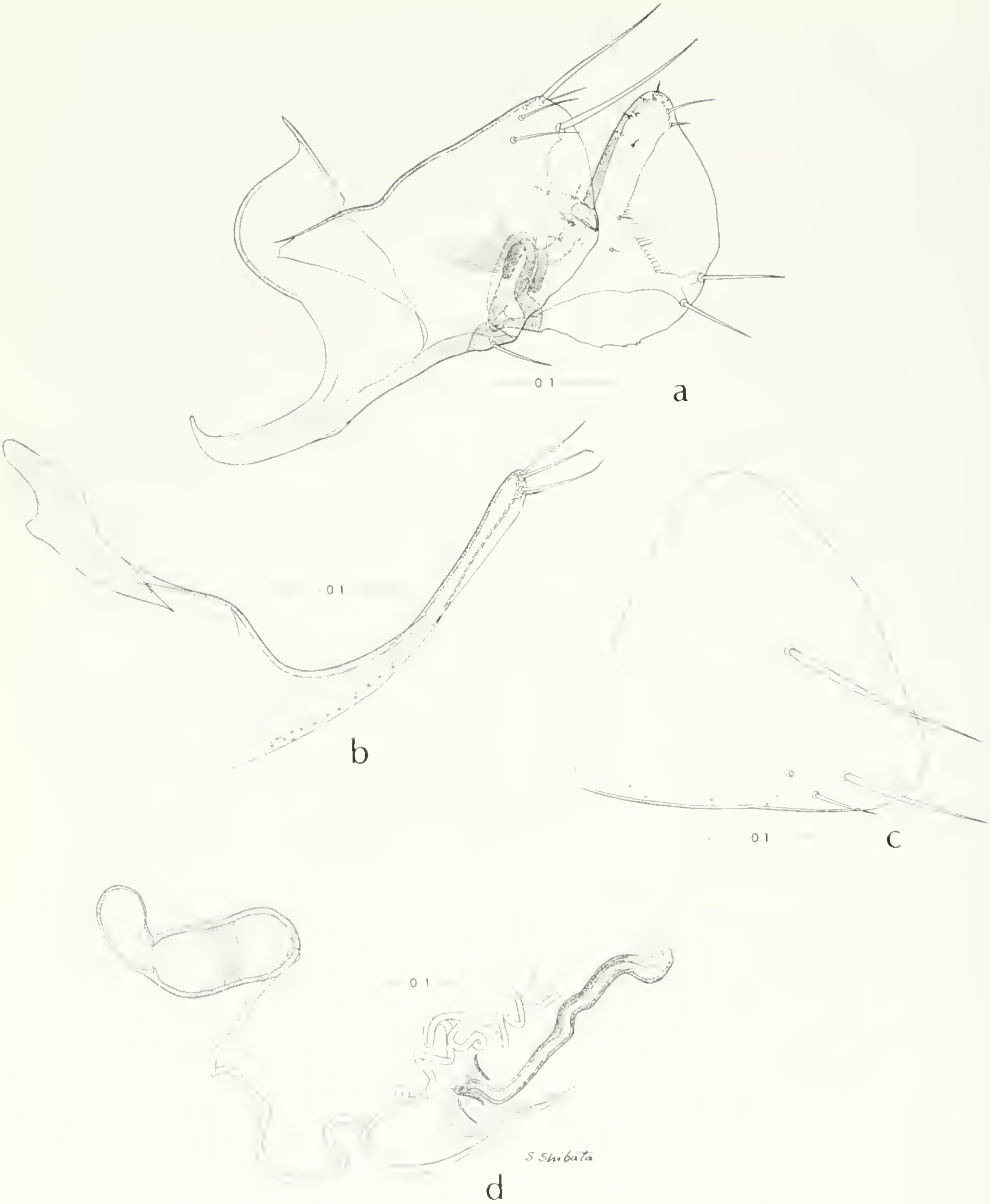


Fig. 41. *Adoratopsylla antiquorum recta*, new subspecies. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. Female: d, spermatheca, duct of spermatheca and bursa copulatrix.

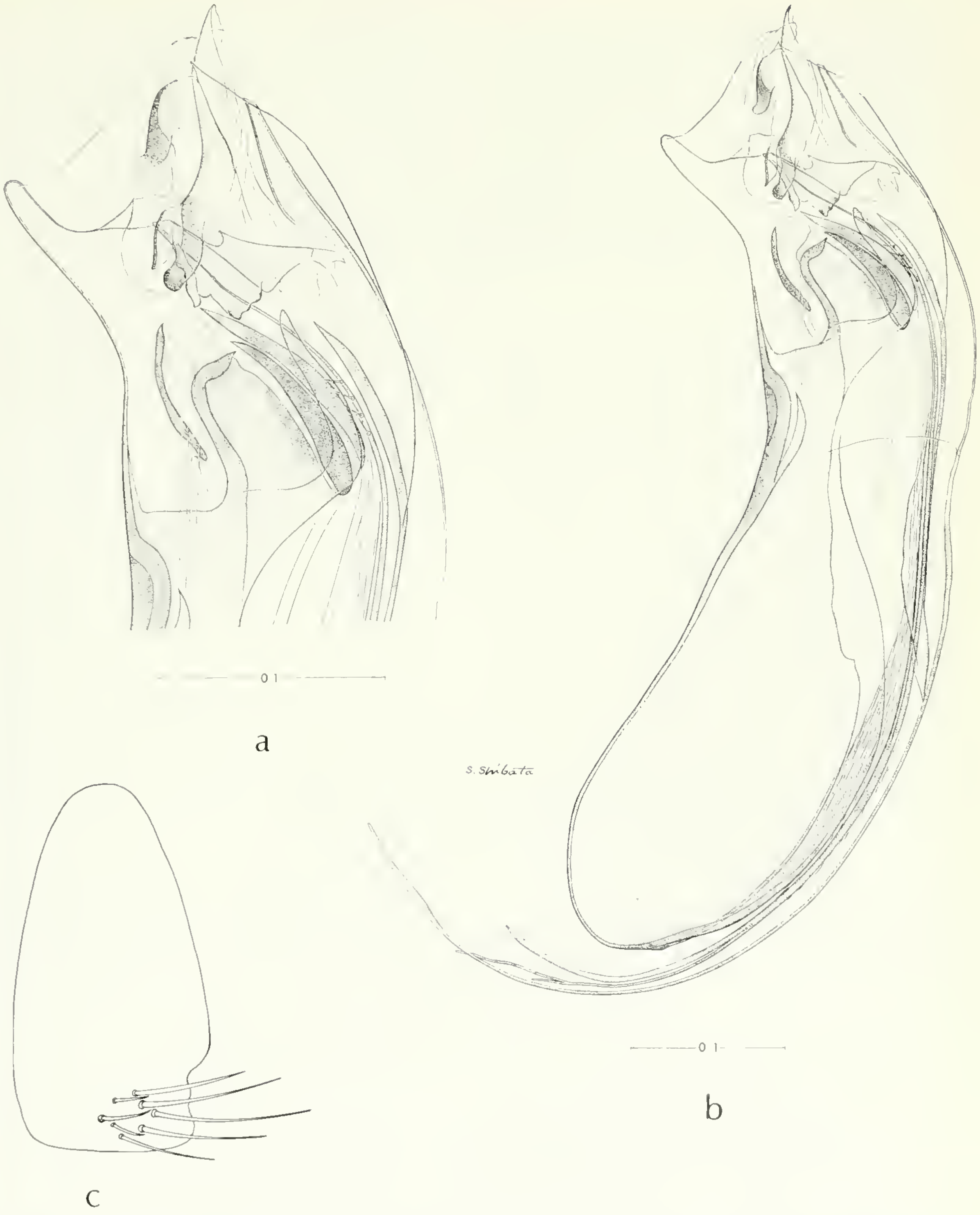


Fig. 42. *Adoratopsylla antiquorum recta,* new subspecies. Male: a, apex of aedeagus. b, aedeagus. Female: c, seventh sternum.

Aedeagus (Fig. 42): Aedeagal apodeme broad, apex rounded; penis rods longer than aedeagal apodeme but not coiled. Apex of hood of aedeagus fingerlike, end chamber a membranous flap. Crochet with broad base, upturned rounded apex.

Female (Fig. 41d). *Modified Abdominal Segments*: Seventh sternum caudal margin with broad shallow sinus, 7 stout setae near caudoventral angle. Bulga of spermatheca with almost parallel sides, striations in middle; hilla short, broad, rounded apex.

Type Data: Male holotype, female allotype, ex *Monodelphis brevicaudata* (SVP 14791), Venezuela: Falcón, near Mirimire, 250 m elev., 12-VIII-1967, Peterson team collectors; 3 male paratypes with same data; 17 male and 16 female paratypes as in Table 5.

Adoratopsylla (*Adoratopsylla*) *bisetosa* Ewing (Fig. 43-46)

Adoratopsylla bisetosa Ewing, 1925:44.—Costa Lima and Hathaway, 1946:228.—Fox, 1947: 118.—Guimarães, 1954:509, 510, 512.—Johnson, 1957:31-32, Pl. 14, Fig. 4.—Barrera and Diaz-Ungria, 1957:165, 178.—Cova Garcia and Tallaferro, 1959:346.—Machado-Allison, 1964: 158, 159, 166, Fig. 1, 3, 5.—1966:24.

Type Data: Three males, 3 females ex *Monodelphis brevicaudata*, Brazil: Rio Branco Santa Maria, 8-IX-1924.

Other Recorded Distribution: Venezuela: ex *Monodelphis brevicaudata*.

Venezuelan Records (7 males and 3 females)

Three males and 2 females ex *Monodelphis brevicaudata* from Sucre, 1 male ex *Monodelphis brevicaudata* from Bolivar, and 3 males and 1 female ex *Sigmomys alstoni* from Bolivar.

Remarks

Morphological differences in specimens from Sucre and Bolívar are evident but appear to be varietal in nature. *A. bisetosa* is probably a marsupial flea but our data are inadequate for determining the optimum environment.

Adoratopsylla (*Adoratopsylla*) *dilecta* Jordan (Fig. 47-50)

Adoratopsylla dilecta Jordan, 1938*b*:168, Fig. 113, 114.—Costa Lima and Hathaway, 1946: 228. — Guimarães, 1954:513. — Johnson, 1957: 32.—Barrera and Diaz-Ungria, 1957:165 178.—Cova Garcia and Tallaferro, 1959:331, 346.—Machado-Allison, 1964: 158, 159, 166, Fig. 2, 4, 6.—1966:26

Type Data: Female holotype ex *Marmosa murina*, Venezuela: Ayantepui Plateau, 1850 m elev., G. H. H. Tate collector.

Other Recorded Distribution: Venezuela: State of Monagas, Caripe, ex *Marmosa robinsoni*.

Venezuelan Records (30 males and 33 females)

There were 25 males and 21 females ex 7 *Marmosa fuscata* from Carabobo, Monagas, and Dt[illegible] Federal. Other hosts include: *Marmosa robinson*[illegible] Miranda and Monagas), *Marmosa murina* (Monagas), *Marmosa cinerea* (Aragua), *Monodelphis brevicaudata* (Aragua) *Heteromys anomalus* (Monagas), *Oryzomys albigularis* (Aragua), *Oryzomys minutus* (Mérida), *Oryzomys fulvescens* (Monagas), and *Proechimys semispinosus* (Monagas).

Remarks

Specimens illustrated (Fig. 47, 48, 49a, b, 50) are from Monagas and agree with descriptions given by Jordan (1938) and Machad Allison (1964), except that the sinus in th

Table 5. Host and Locality for Type Specimens of *Adoratopsylla* (*Adoratopsylla*) *antiquorum recta*, New Subspecies.

Males	Females	SVP Number	Host	Locality	Elevation in meters
2	2	2486	*Monodelphis brevicaudata*	Trujillo: Valera, nr Isnotu	900
2	4	10600	*Carollia perspicillata*[1]	Miranda, 19 km E Caracas nr Curapao	1160
4	1	14791	*Monodelphis brevicaudata*	Falcón: nr Mirimire	250
	3	14809	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	
3	3	14810	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	
1		14843	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	122
	1	14900	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	85
1		14920	*Zygodontomys brevicauda*	Falcón: Mirimire nr La Pastora	90
1		14962	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	145
1	1	14970	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	160
[illegible]		20113	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	125
1	2	20222	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	130
1		20284	*Monodelphis brevicaudata*	Falcón: Mirimire, nr La Pastora	155

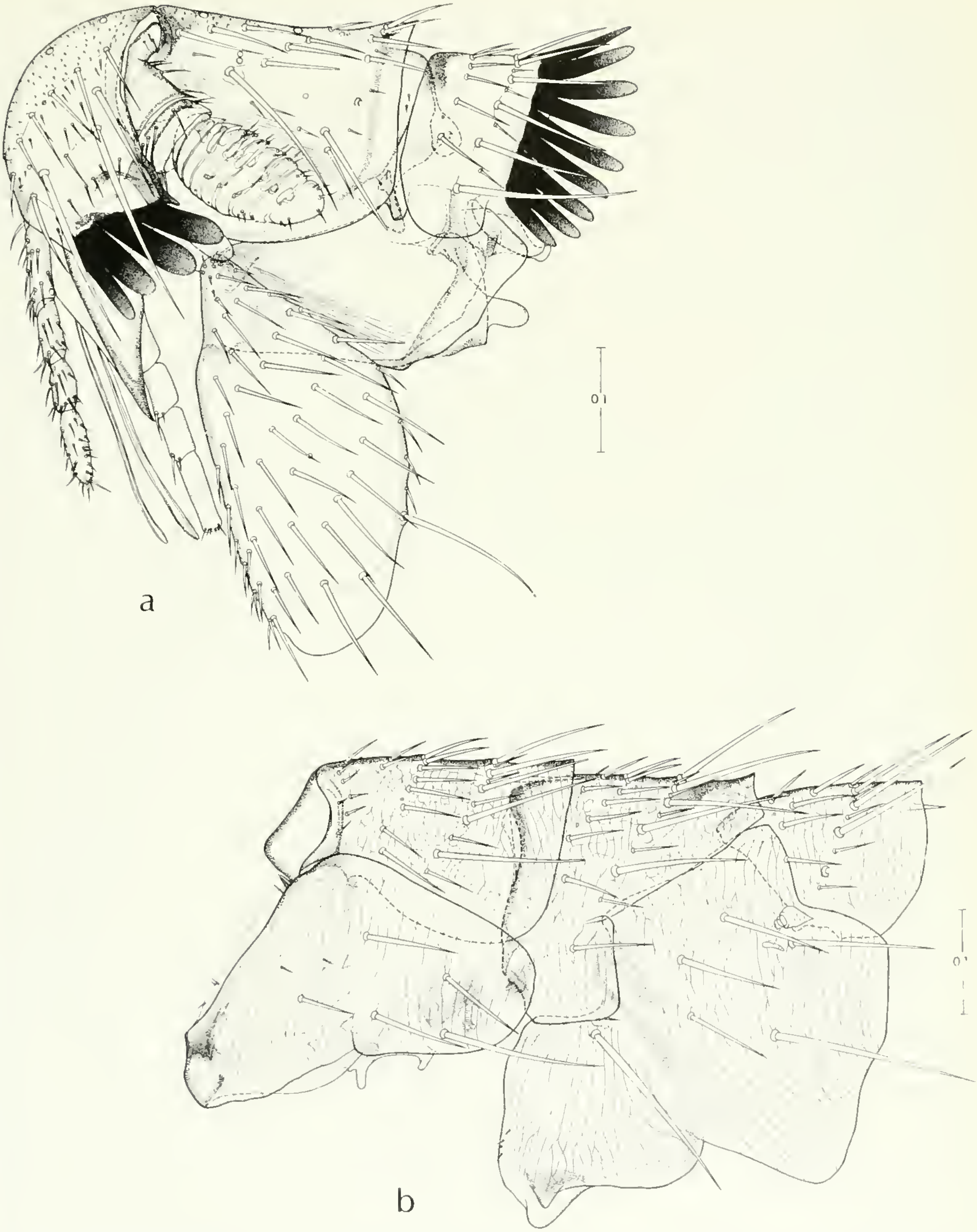


Fig. 43. *Adoratopsylla bisetosa* Ewing. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

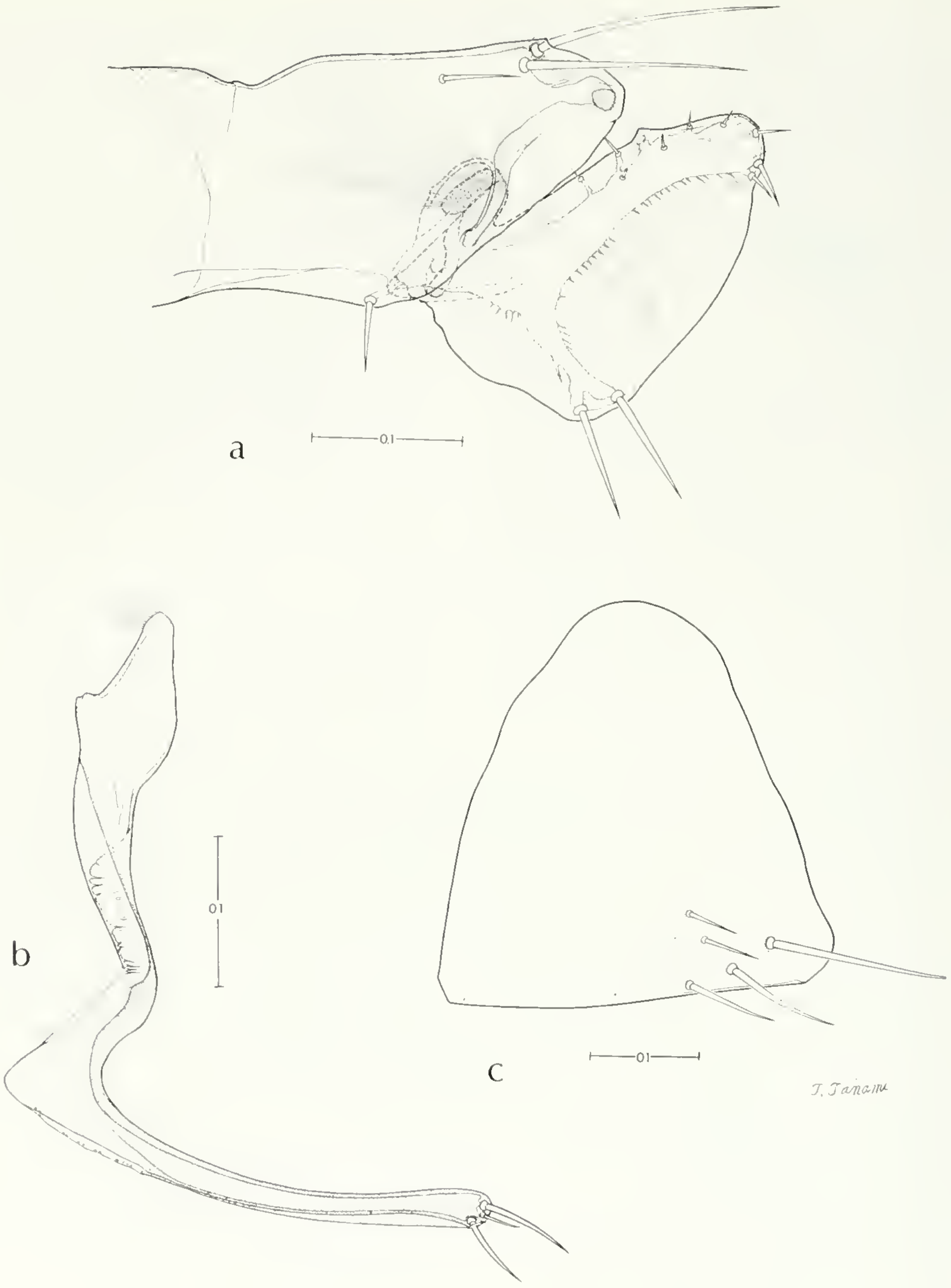


Fig. 44. *Adoratopsylla bisetosa* Ewing. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

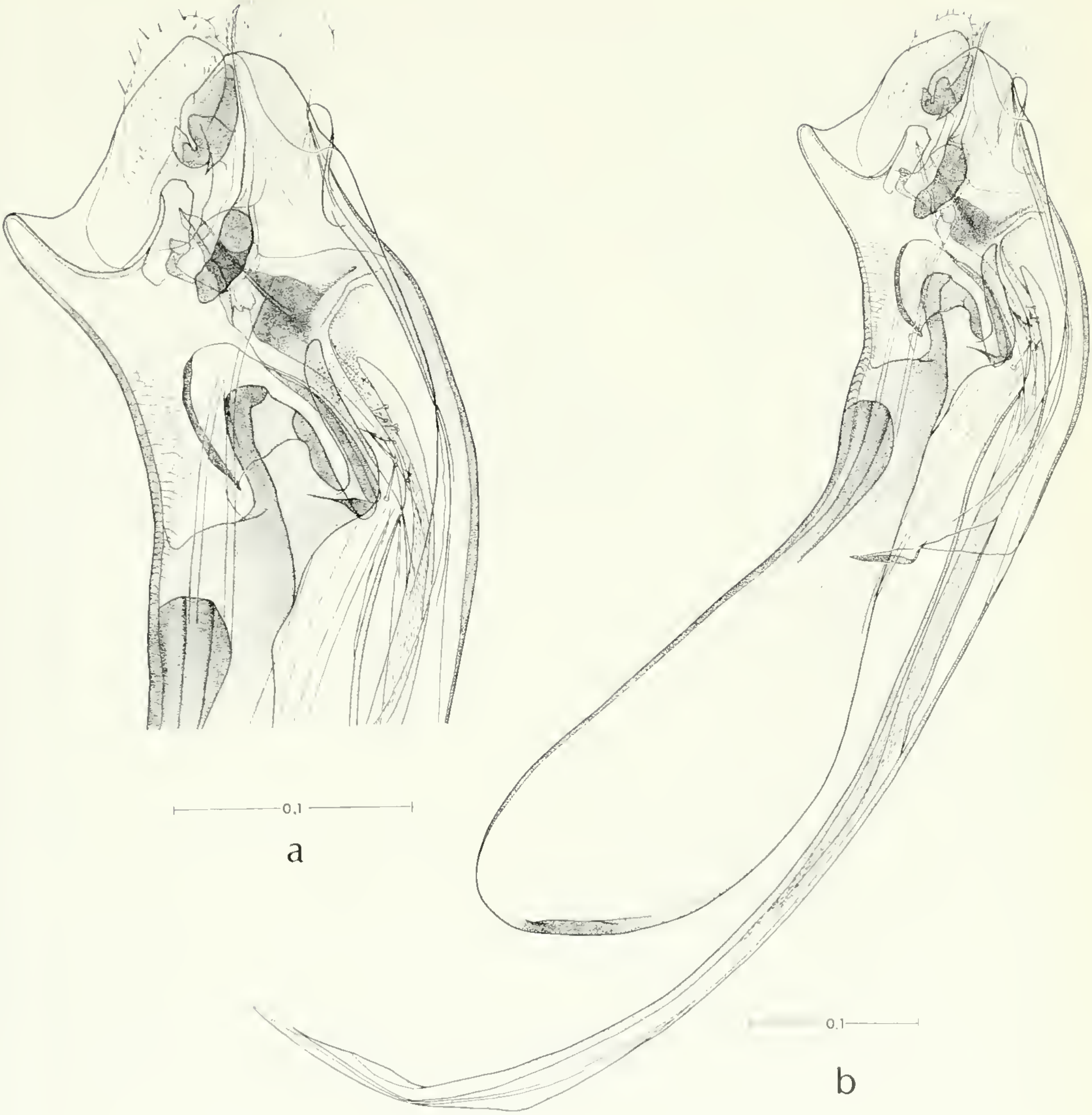


Fig. 45. *Adoratopsylla bisetosa* Ewing. Male: a, apex of aedeagus. b, aedeagus.

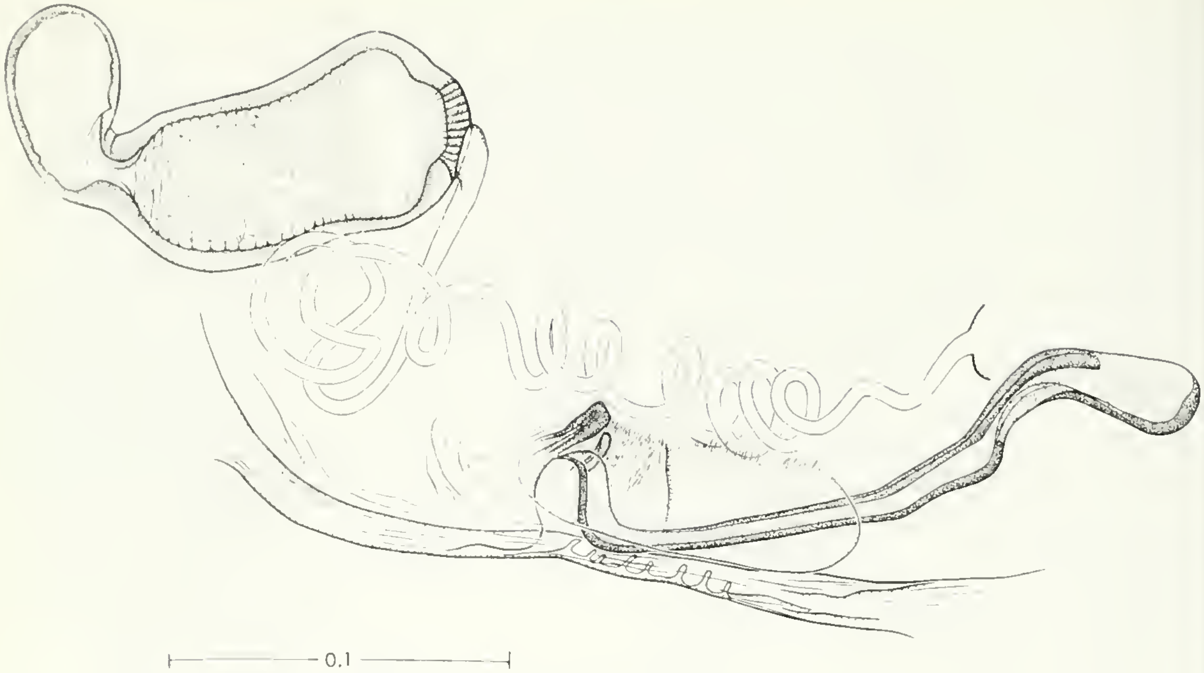


Fig. 46. *Adoratopsylla bisetosa* Ewing. Female: spermatheca, duct of spermatheca and bursa copulatrix.

posterior margin of the seventh sternum of the female is variable but usually not so triangular as shown by Machado-Allison. A short series from Aragua, Carabobo, Miranda, and Dto. Federal differs from Monagas specimens in details of the male genitalia: the posterior margin of the movable process of the clasper is not evenly rounded but has an irregular outline, the paired setae are on the ventral half of the margin and the hood of the aedeagus is not so long and narrow (Fig. 49c, d). In the female the sinus of the seventh sternum is narrower and somewhat deeper. Our records, though inadequate, indicate that *Marmosa fuscata* is the preferred host of *A. dilecta* in Venezuela although it was collected on other species of *Marmosa* as well.

Adoratopsylla (*Tritopsylla*) *intermedia intermedia* (Wagner)

(Fig. 51-54)

Typhlopsylla intermedia Wagner, 1901:22, Pl. 1, Fig. 7, 9.

Stenopsylla intermedia intermedia, Jordan, 1926: 391, Fig. 13, 14.

Tritopsylla intermedia, Pinto, 1930:349, Fig. 138, 181, 182.–Jordan, 1938*b*:164.–Fox, 1947:119.

Tritopsylla intermedia intermedia, Guimarães, 1940:231.–Costa Lima and Hathaway, 1946: 227, 228.–Cova Garcia and Tallaferro, 1959: 331, 347.

Adoratopsylla (*Tritopsylla*) *intermedia intermedia*, Johnson, 1957:32, 33. – Smit and Wright, 1965:22.–Hopkins and Rothschild, 1966:117-121, Fig. 175, 176, 178, 180, 183, 184, 187, 188; Pl. 3E, F.

Type Data: Type series ex unknown host, Paraguay: received from A. Poppe (Poppe was not the collector). Two females ex *Metachirus opossum* (=*Philander opossum*), Ecuador: Paracube, K. Rothschild collector.

Other Recorded Distribution: Argentina, Bolivia, Brazil, Paraguay, Peru, and Venezuela: ex marsupials for the most part.

Venezuelan Records (257 males and 335 females)

There were 171 males and 261 females ex 23 *Didelphis marsupialis* in Aragua, Barinas, Bolívar, Dto. Federal, Miranda, Monagas, and Yaracuy; 49 males and 31 females ex 7 *Didelphis azarae* in Bolivar and T. F. Amazonas. The remaining 70 specimens were collected from: *Rhipidomys venustus*, *Felis tigrina*, *Akodon urichi*, *Oryzomys minutus* (Dto. Federal); *Caluromys philander* (Dto. Federal and Monagas); *Caluromys* sp.[4] (Monagas); *Artibeus jamaicensis*[3], *Marmosa murina* and *Oryzomys fulvescens* (Monagas); *Philander opossum* (T. F. Amazonas); *Metachirus nudicaudata* (Barinas and Bolívar), and *Monodelphis brevicaudata* (Barinas).

Remarks

The morphological characters which have been used to separate subspecies of *Adoratop-*

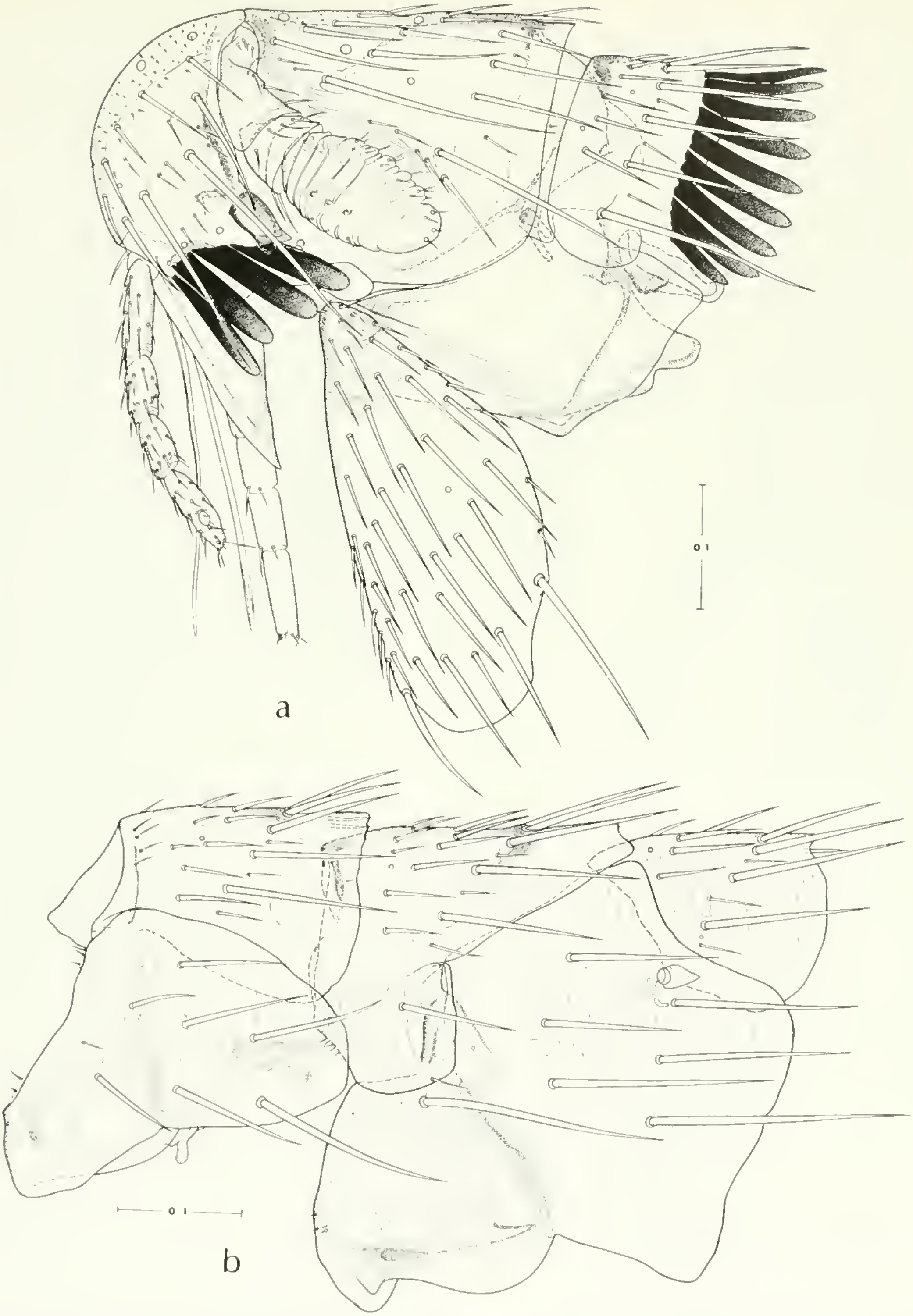


Fig. 47. *Adoratopsylla dilecta* Jordan. Male: a head prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

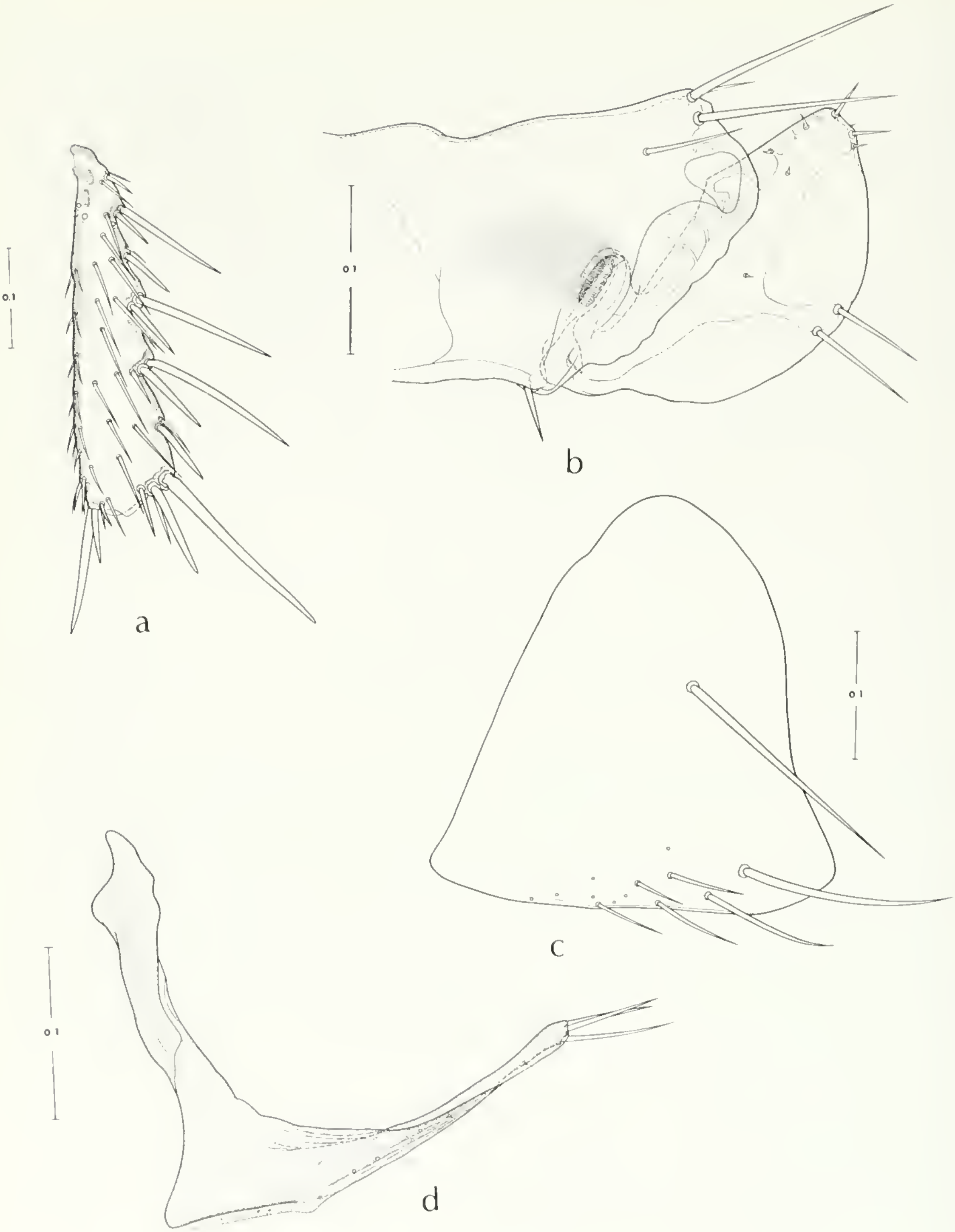


Fig. 48. *Adoratopsylla dilecta* Jordan. Male: a, metatibia. b, process and movable finger of clasper. c, eighth sternum. d, ninth sternum.

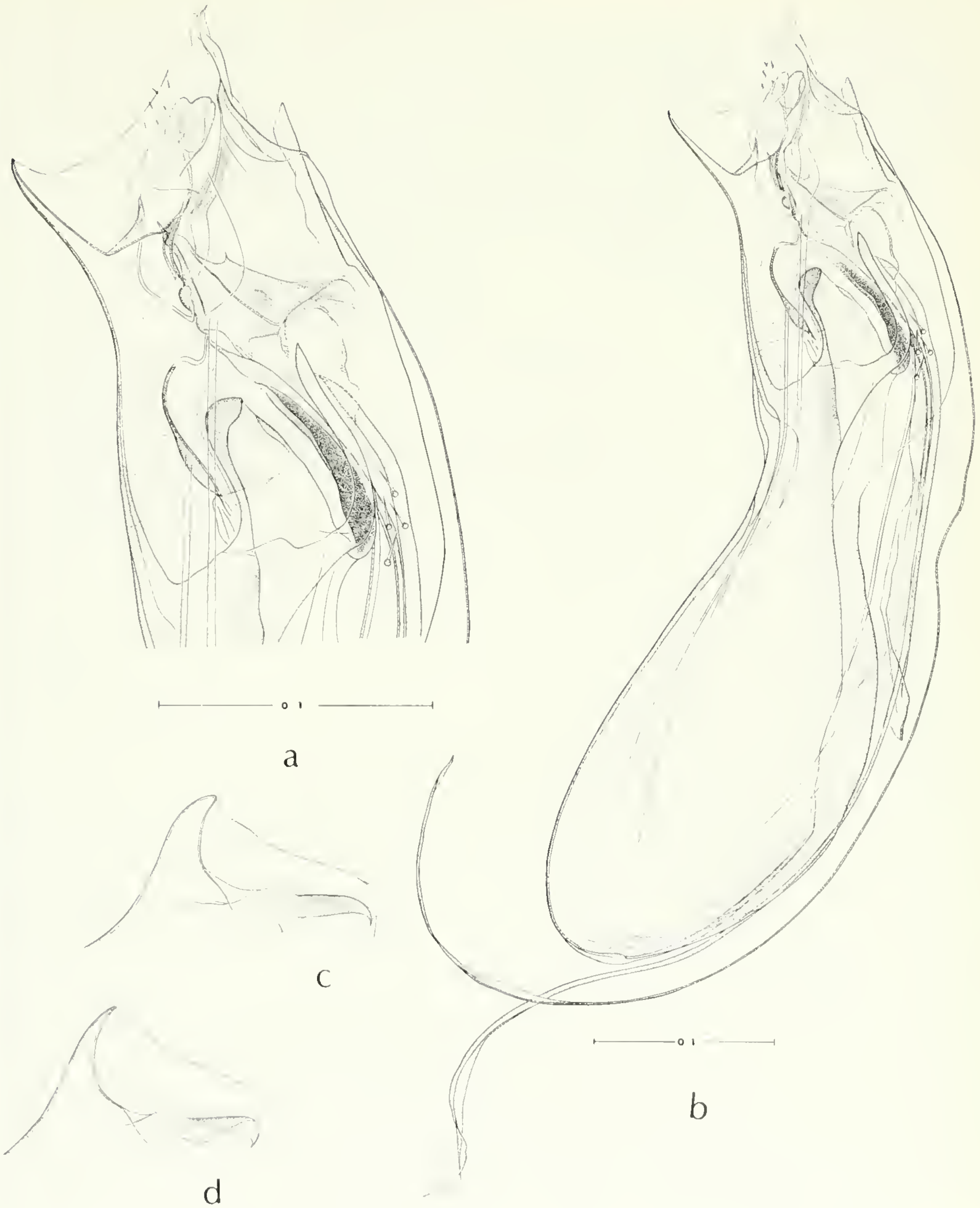


Fig. 49. *Adoratopsylla dilecta* Jordan. Male: a, apex of aedeagus. b, aedeagus. c and d, median dorsal lobe of aedeagus.

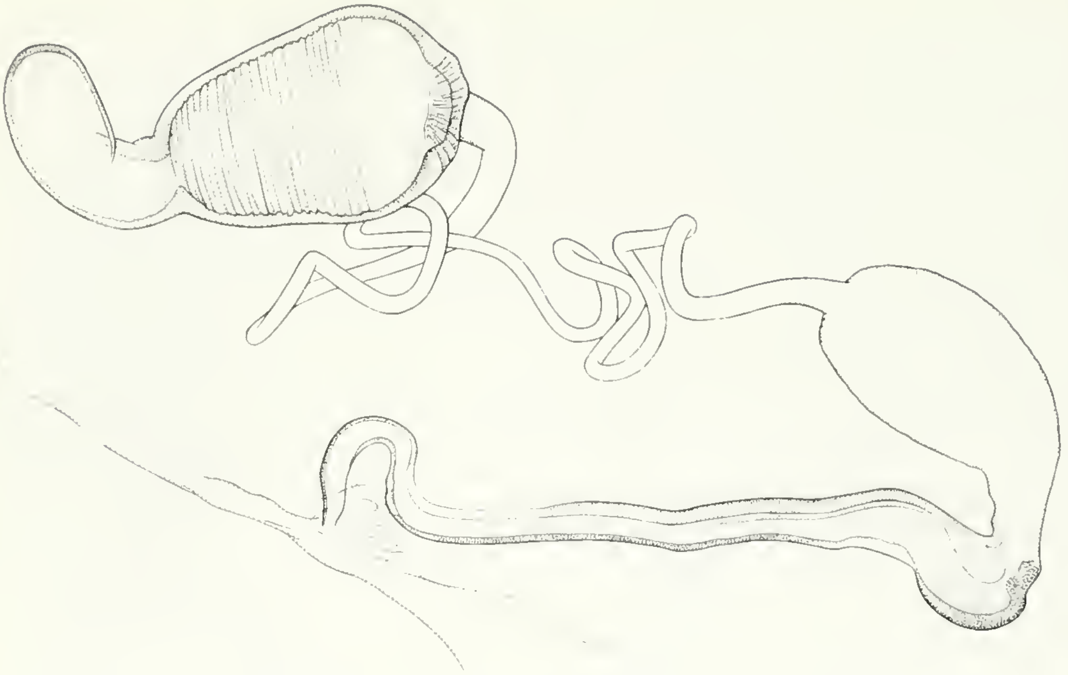


Fig. 50. *Adoratopsylla dilecta* Jordan. Female: spermatheca, duct of spermatheca and bursa copulatrix.

sylla intermedia are highly variable. Most of our specimens were collected in widely separated localities (Caracas, Monagas, Barinas, T. F. Amazonas, and Bolívar) and from a variety of hosts. In general, lobe 2 of the immovable process of the clasper is longer and narrower and the movable process is wider in specimens from Caracas versus those from Bolívar but in a long series of 47 males and 87 females from a single host the variation is almost as great as in the material from all of Venezuela. We concur with Hopkins and Rothschild (1966) and Guimarães (*in litt.*) in calling Venezuelan specimens *Adoratopsylla intermedia intermedia*.

We collected 432 specimens of *A. i. intermedia* from 25 specimens of *Didelphis marsupialis* and 80 from 7 *Didelphis azarae*. Thus of the 582 specimens of *A. i. intermedia* collected 88% were associated with marsupials of the genus *Didelphis* and the remaining 12% from other hosts.

Genus *Neotyphloceras* Rothschild

Neotyphloceras Rothschild, 1914:243.

Type Species: *Typhloceras rosenbergi* Rothschild.

Neotyphloceras rosenbergi (Rothschild)
(Fig. 55-58)

Typhloceras rosenbergi Rothschild, 1904:639, Pl. 13, Fig. 68-69, 71, 74; Pl. 14, Fig. 71, 74.

Paleopsylla rosenbergi, Baker, 1905:153.

Neotyphloceras rosenbergi, Rothschild, 1914: 244.—Jordan, 1936:310.—Costa Lima and Hathaway, 1946:229.—Macchiavello, 1948: 26.—Jordan, 1950:605.—Johnson, 1957:27, Pl. 9, Fig. 3, 4; Pl. 10, Fig. 4.—Machado-Allison, 1964:164, 165.—1966:26.—Hopkins and Rothschild, 1966:131-133, Fig. 115, 198, 199, Pl. 4C, 4D.

Type Data: One male, 2 females ex *Metachirus opossum* (=*Philander opossum*), Ecuador: Cayembe, 12-VI-1897, W. F. H. Rosenberg collector. One male, 6 females *ibid.* but ex *Didelphis azarae*, 21-VI-1897. Two females *ibid.* but Ibarra, 31-V-1897.

Other Recorded Distribution: Ecuador, thirteen localities, ex species of the following genera: *Didelphis*, *Oryzomys*, *Rhipidomys*, *Thomasomys*, *Akodon*, *Sigmodon*, *Stictomys*, and rats and their nests. Peru: three localities, ex species of the folowing genera: *Oryzomys*, *Rhipidomys*, and *Akodon*. Colombia: four localities, ex species of the following genera: *Marmosa*, *Sciurus*, *Oryzomys*, *Rhipidomys*, *Thomasomys*, *Chilomys*, *Rheomys*, *Stictomys*, and *Mustela*, (for more detailed information see Johnson, 1957).

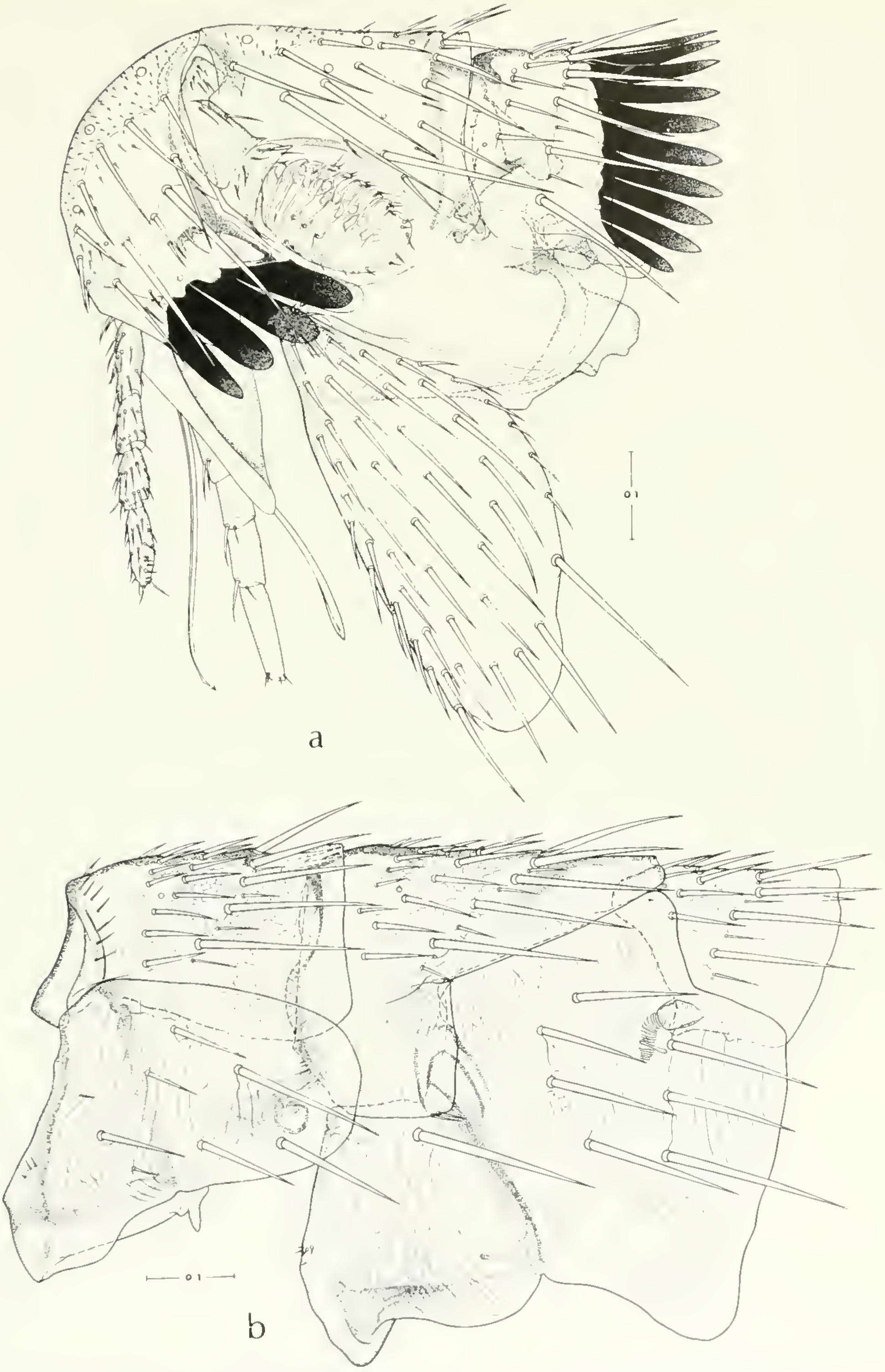


Fig. 51. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

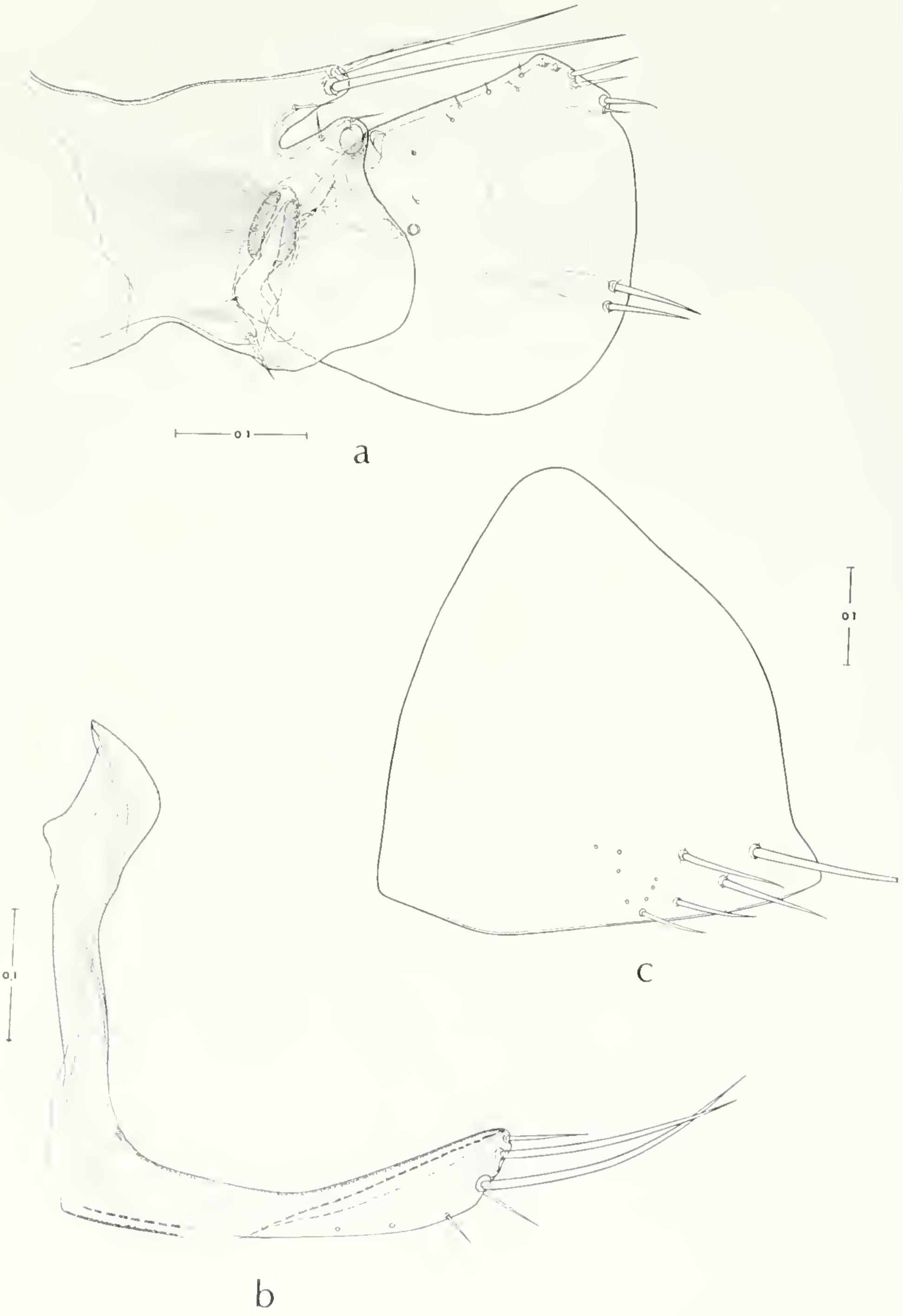


Fig. 52. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

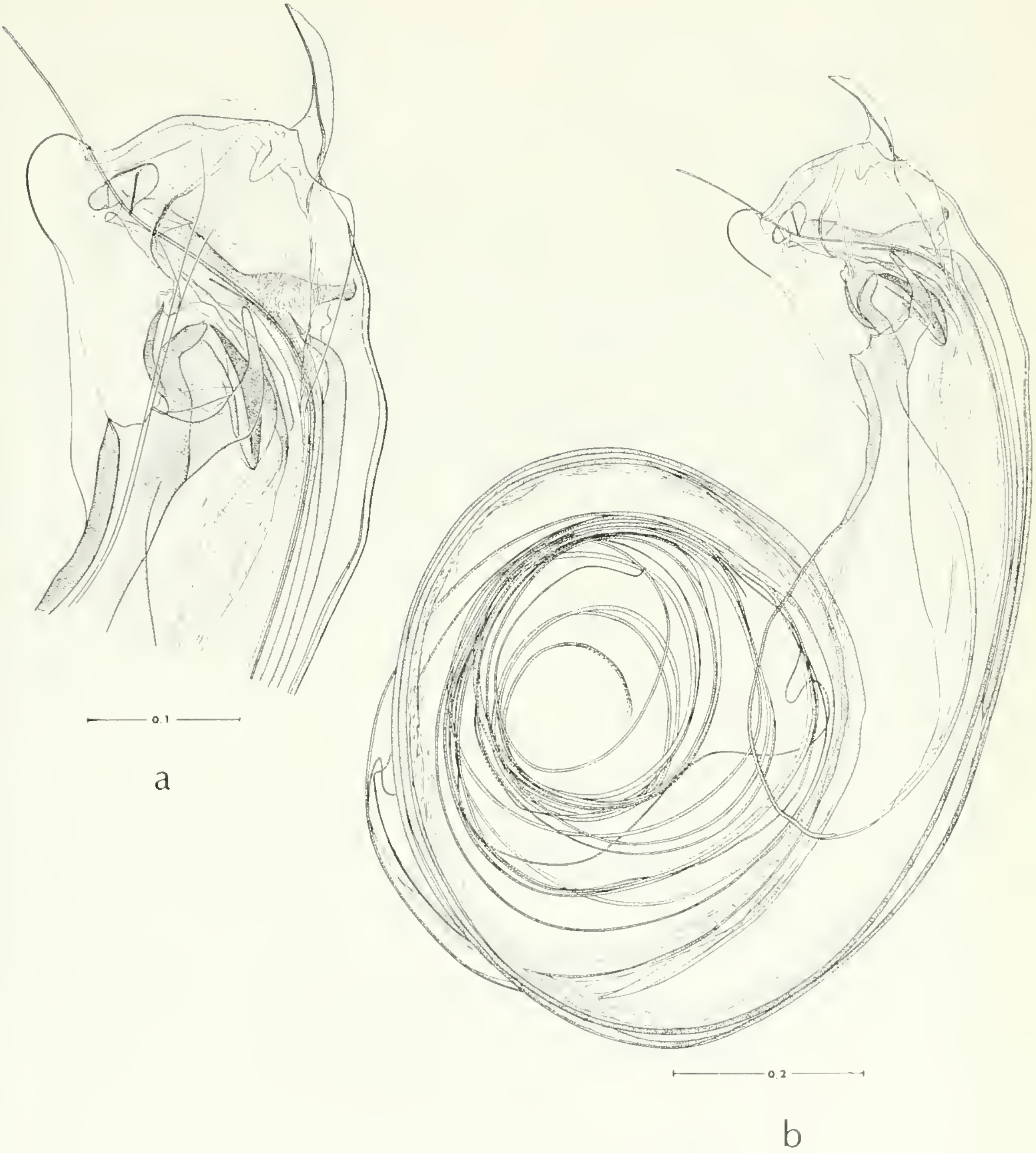


Fig. 53. *Adoratopsylla intermedia intermedia* (Wagner). Male: a, apex of aedeagus. b, aedeagus.

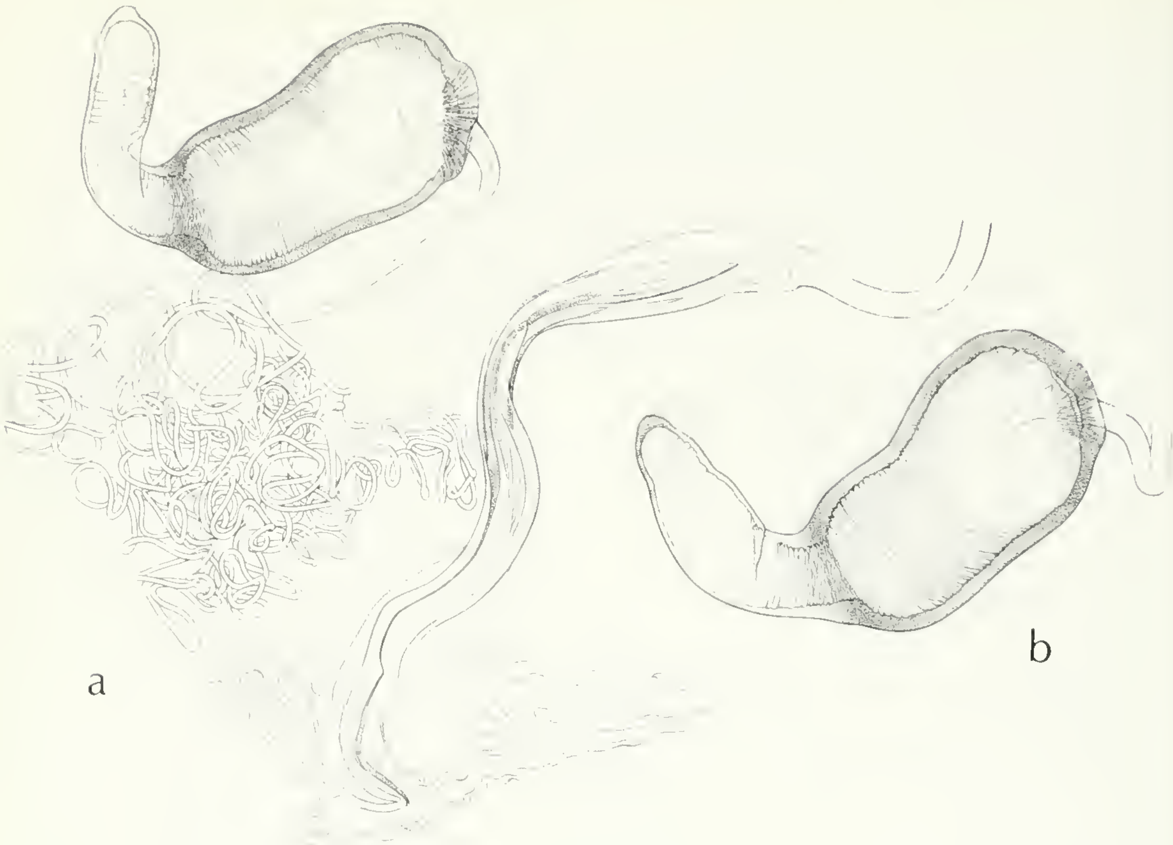


Fig. 54. *Adoratopsylla intermedia intermedia* (Wagner). Female. a, spermatheca, duct of spermatheca and bursa copulatrix. b, spermatheca.

VENEZUELAN RECORDS (87 males and 112 females). See Table 6.

REMARKS

Initially it appeared that there were at least two and perhaps three distinct geographic populations represented in our collections based on the shape and length of the fingerlike apodeme at the base of the claspers, width of and degree to which the manubrium is curved and length of the finger of the clasper. However, in one series of 17 males and 28 females from a single host (*Didelphis azarae*) there is considerable variation in these characters though not as much as between populations. Venezuelan specimens do not agree in all details with illustrations given

Table 6. Venezuelan Records of *Neotyphloceras rosenbergi* (Rothschild).

Host Animals	Collecting Localities Caracas 1474-2256 m elevation			Trujillo 2210-2360 m elevation			Merida 2560-3155 m elevation			Monagas 1200-1340 m elevation			Tachira 2370-2425 m elevation)		
		♂	♀		♂	♀		♂	♀		♂	♀		♂	♀
Rhipidomys venustus	(5)	4	2	(9)	9	13	(3)	1	2	(3)	4	2	(6)	3	3
Oryzomys albigularis	(13)	8	5	(4)	0	5	(1)	0	1				(1)	1	0
Oryzomys concolor	(1)	1	0							(1)	0	1			
Oryzomys minutus	(1)	0	1	(1)	0	1	(6)	1	6				(1)	1	0
Thomasomys laniger				(7)	6	5	(2)	1	3						
Thomasomys lugens				(1)	0	1	(7)	18	13						
Thomasomys hylophilus													(8)	3	6
Thomasomys vestitus				(1)	1	0									
Heteromys anomalus	(2)	2	1												
Didelphis azarae							(2)	17	29						
Caluromys philander										(1)	6	3			
Marmosa dryas				(3)	0	4	(1)	0	1						

The numbers of host animals are represented by the numerals in parentheses.

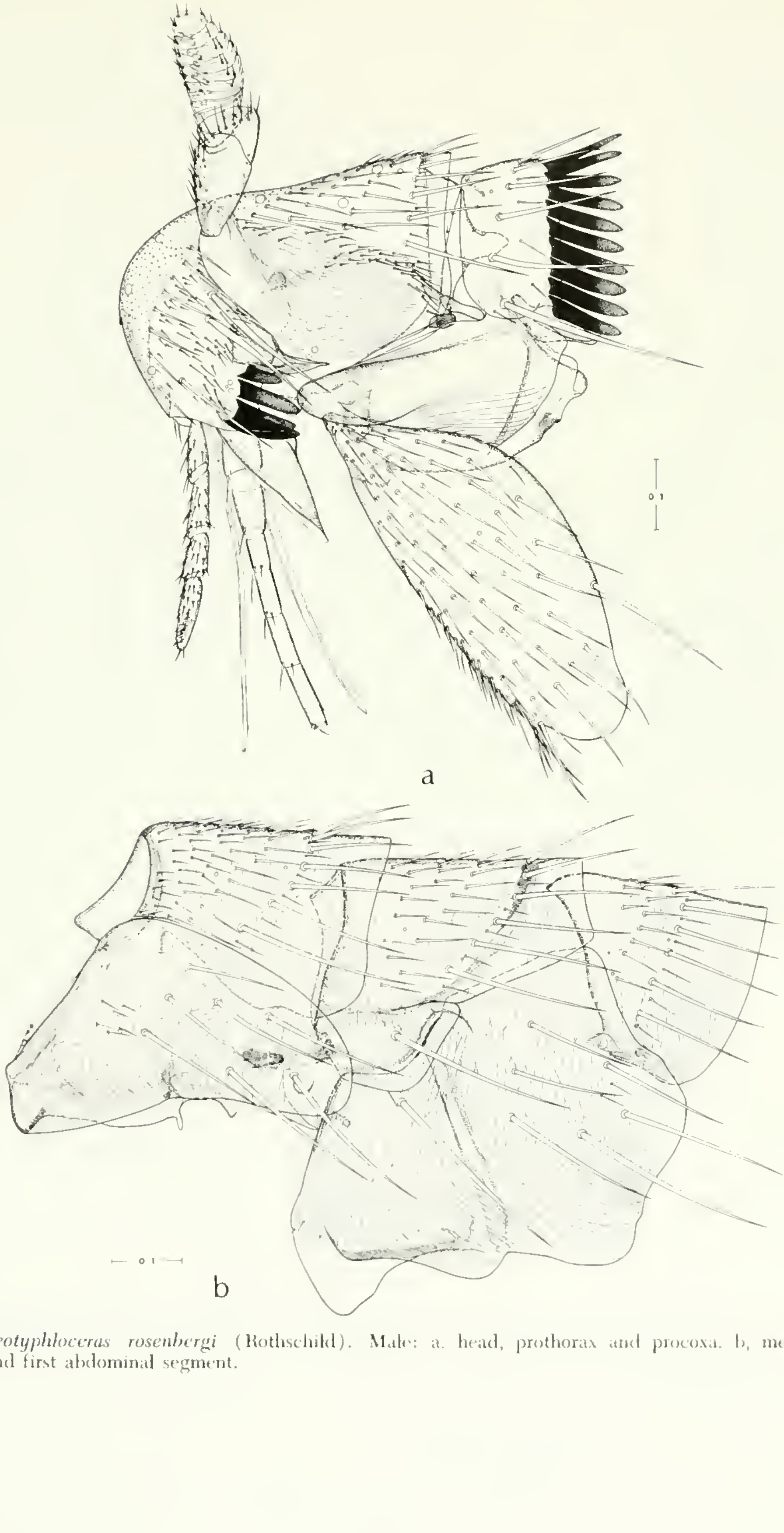


Fig. 55. *Neotyphloceras rosenbergi* (Rothschild). Male: a. head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

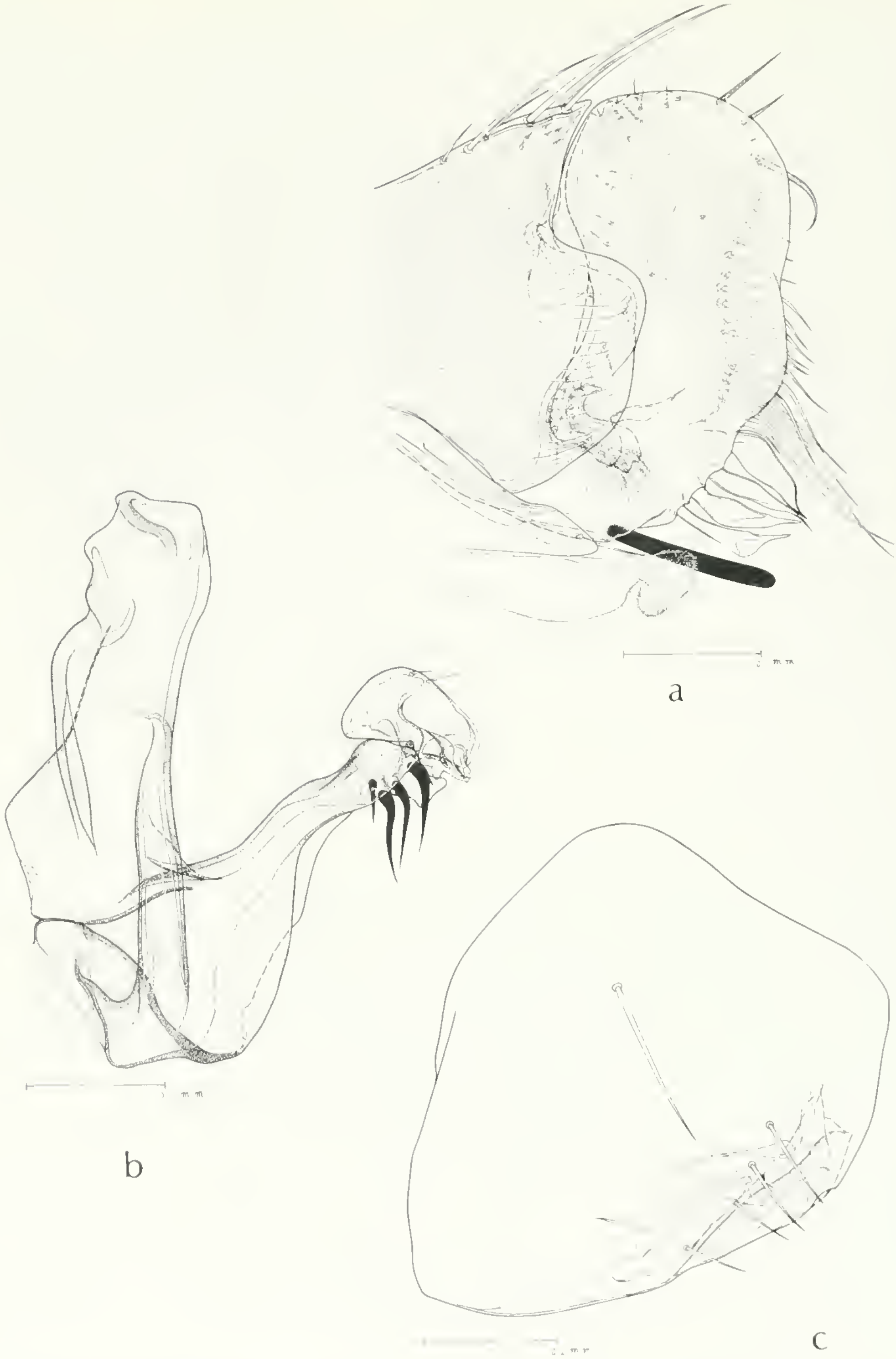


Fig. 56. *Neotyphloceras rosenbergi* (Rothschild). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

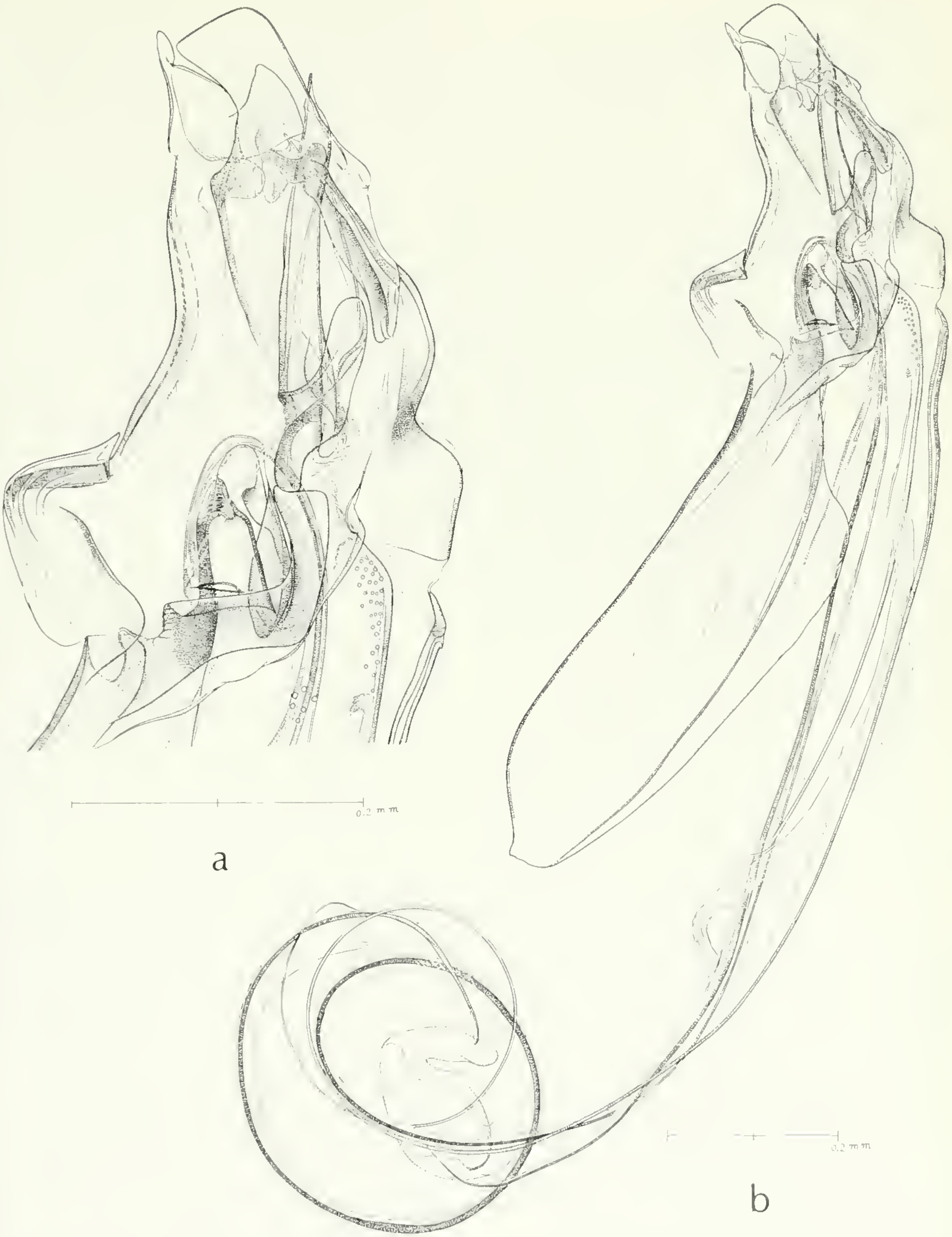


Fig. 57. *Neotyphloceras rosenbergi* (Rothschild). Male: a, apex of aedeagus, b, aedeagus.

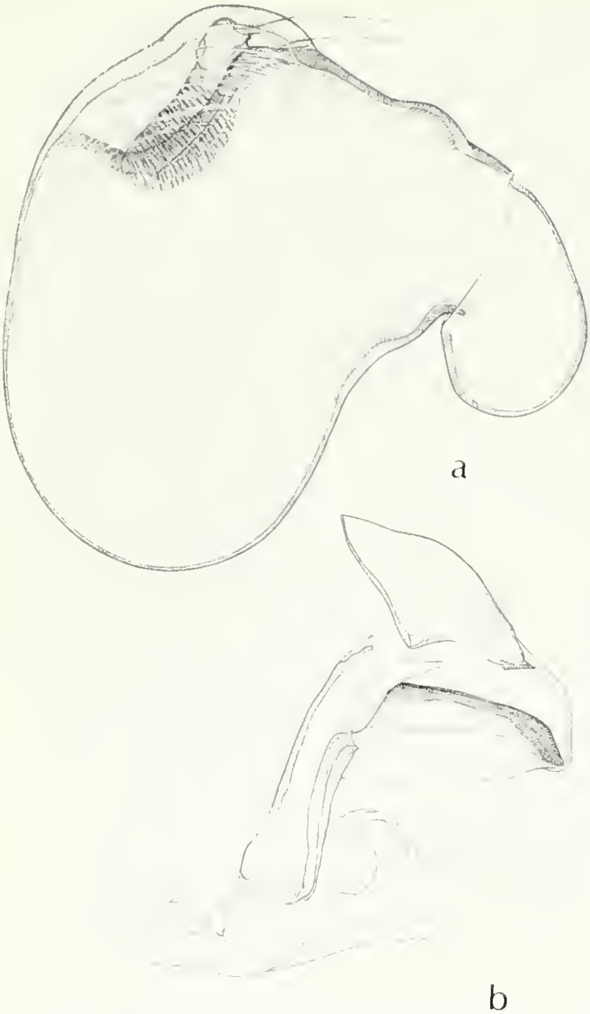


Fig. 58. *Neotyphloceras rosenbergi* (Rothschild). Female: a, spermatheca. b, bursa copulatrix.

by Johnson (1957). This is particularly true of the apical portion of the distal arm of the ninth sternum and the aedeagus. The male genitalia in this species is exceptionally complex and several structures are very delicate and thus susceptible to distortion. Some of the variation may be due to this factor but in addition this species is probably represented by several large relatively isolated populations each of which occurs on a host species.

According to Smit (1967) the genal spines of our specimens are more truncate than in specimens from other areas.

Although *N. rosenbergi* appears to be promiscuous in its host associations it is likely a marsupial flea. From one host (*Didelphis azarae*), captured above 2,743 meters elevation, we collected 17 male and 28 female fleas. There were 57 fleas on 26 host animals (four species of *Thomasomys*) 43 fleas on 26 host animals (*Rhipidomys venustus*), and 21 fleas on 20 host animals (*Oryzomys albigularis*). Essentially all specimens of *N. rosenbergi* were collected above 1,829 meters elevation.

Family Stephanocircidae

Genus *Cleopsylla* Rothschild

Cleopsylla Rothschild, 1914:246.

Type Species: *Cleopsylla townsendi* Rothschild.

Cleopsylla monticola Smit

(Fig. 59, 60, 68a)

Cleopsylla monticola Smit, 1953:193-197 Fig. 13, 15, 17, 19, 21.—Hopkins and Rothschild 1956:127-130, Fig. 210, 214, 216, 218, 221; Pl. 1 13G, 16A.—Johnson, 1957:61

Type Data: Male holotype, female allotype, ex *Caenolestes fulginosus* (=*C. fuliginosus*), Ecuador: Pichincha, 1-X-1931; 1 female and 1 male paratypes ex *Sigmodon* species, Chimborazo, IV-1931; 1 male paratype, ex *Thomasomys* species, Illiniza, IV-1931, F Spillmann collector.

Other Recorded Distribution: Colombia: 1 female ex *Rhipidomys* species

Venezuelan Records (55 males and 87 females)

There were 26 males and 56 females ex 20 *Oryzomys albigularis* in Dto. Federal Trujillo, Mérida, and Táchira. Also, 8 males and 7 females ex 9 *Oryzomys minutus* in Trujillo, Mérida and Táchira There were 5 males and 9 females ex 9 *Rhipidomys venustus* and 1 *Rhipidomys* sp.[1] in Trujillo Mérida, and Táchira; 12 males and 11 females ex *Thomasomys laniger* (Trujillo and Mérida), *Thomasomys hylophilus* (Táchira) *Thomasomys lugens* (Trujillo and Mérida), *Thomasomys vestitus* (Trujillo), and *Thomasomys* sp.[1] (Mérida). In addition 8 specimens were collected from *Marmosa fuscata* (Dto Federal), *Marmosa dryas* (Trujillo), *Didelphis marsupialis* (Trujillo). *Chilomys instans* (Táchira), and birds[3] (Dto. Federal and Mérida)

Remarks

There is some intraspecific variation. In our specimens the anterior margin of the frons is convex as in *C. townsendi*. The spine on the genal process and the occipital tubercle are better developed than shown by Smit (1953) for *C. townsendi* and *C. monticola*. Our collection records, though rather meager, suggest that this flea is more ecologically tolerant than other species in the family. The areas in which it was collected varied in elevation from 1413 meters to 3170 meters but most specimens were collected at 2200-2500 meters and one specimen was collected on *Didelphis marsupialis* at 120 meters elevation *Oryzomys albigularis* is probably the

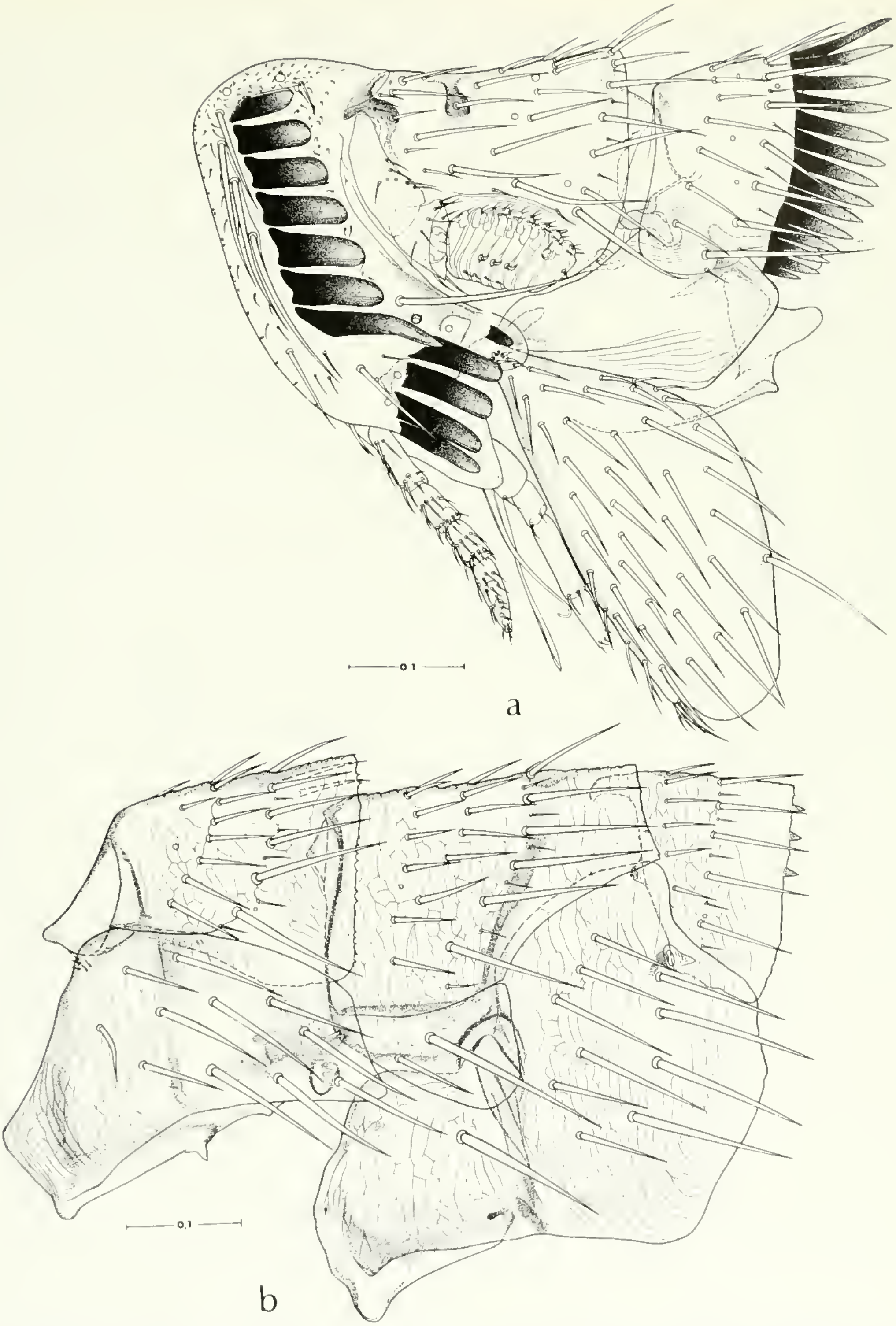


Fig. 59. *Cleopsylla monticola* Smit. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

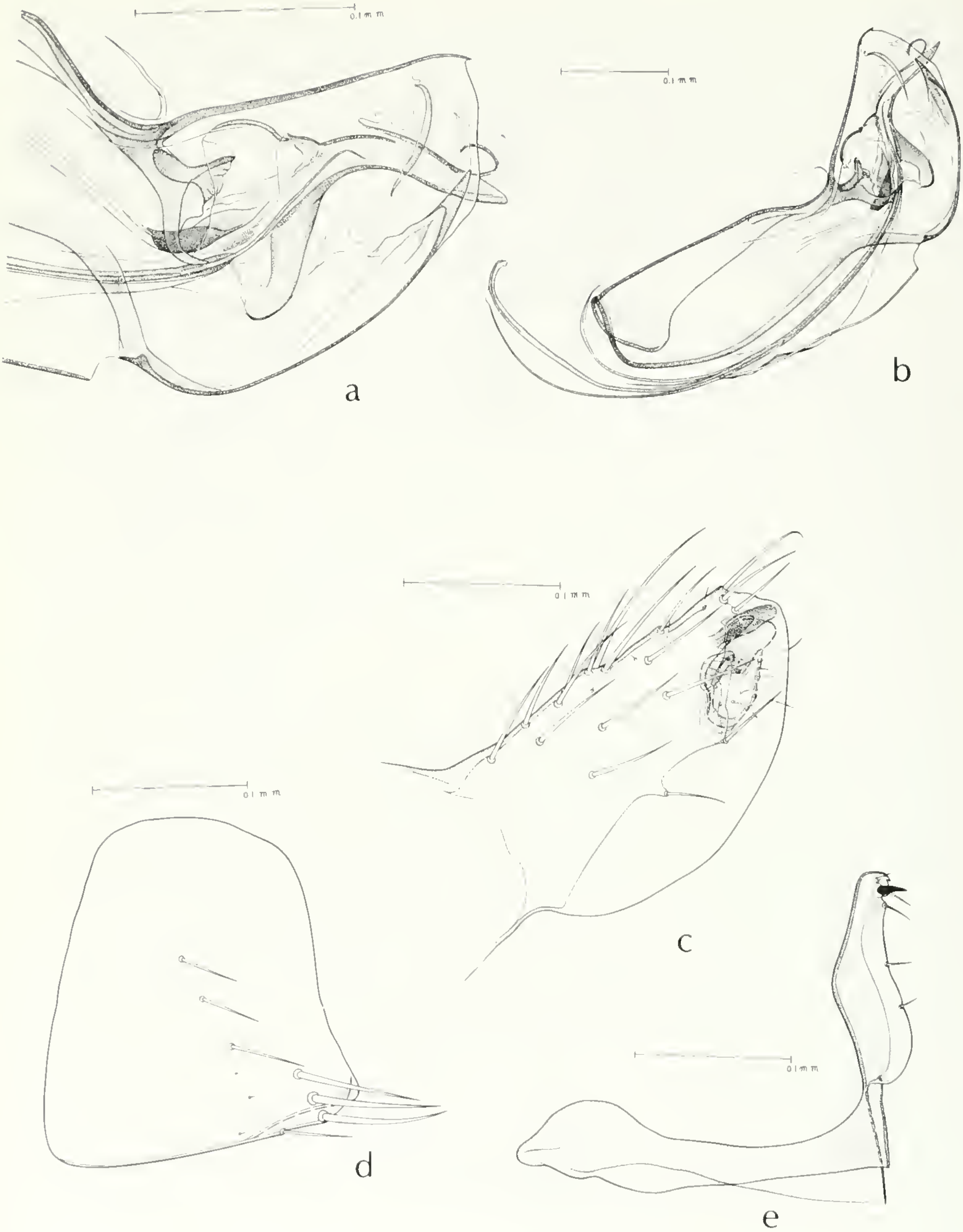

0.1 mm
0.1 mm
a
b
0.1 mm
0.1 mm
c
0.1 mm
d
e

Fig. 60. *Cleopsylla monticola* Smit. Male: a, apex of aedeagus. b, aedeagus. c, process and movable finger of clasper. d, eighth sternum. e, ninth sternum.

preferred host in Venezuela although it occurred on species of *Thomasomys* and *Rhipidomys* with sufficient frequency to indicate more than an accidental relationship.

Genus *Craneopsylla* Rothschild

Craneopsylla Rothschild, 1911:120.

Type Species: *Stephanocircus wolffhuegeli* Rothschild.

Craneopsylla minerva minerva (Rothschild)

(Fig. 61-64, 68b)

Stephanocircus minerva Rothschild, 1903*b*:319, Pl. 9, Fig. 6, 7.

Craneopsylla minerva, Rothschild, 1914:251.

Craneopsylla minerva minerva, Hopkins, 1951: 537, Fig. 5.—Smit, 1953:201, Fig. 32.—Hopkins and Rothschild, 1956:140-142, Fig. 237, 238; Pl. 14B, 17B.—Johnson, 1957:65, 66.

Type Data: Female holotype and paratype female ex *Didelphis azarae*, Paraguay: Sapucay, 1901, W. Foster collector.

Other Recorded Distribution: Brazil: ex *Metachirops opossum quica* (=*Philander opossum quica*), and *Nectomys squamipes*. Argentina: ex *Deltamys benysiparana*, *Oxymycterus platensis*, *Scapteromys tomentosus*, and *Holochilus balnearum* (=*H. brasiliensis balnearum*). Peru: ex "wild rat."

Venezuelan Records (6 males and 19 females)

There were 3 male and 8 female specimens ex 3 *Rhipidomys venezuelae* (Dto. Federal), 2 males and 4 females ex 1 *Rhipidomys venustus* (Monagas), and 1 male and 6 females ex *Rhipidomys macconnelli* (Falcón and T. F. Amazonas). In addition 1 specimen each was collected from *Oryzomys albigularis* in Sucre, and *Akodon urichi* in T. F. Amazonas.

Remarks

The key character given by Johnson (1957) to separate *C. minerva minerva* from *C. minerva wolffhuegeli* is the number of spines in the genal comb: *minerva* has 5 and *wolffhuegeli* has 7 or 8. Most of our specimens have 6 spines but two or three have only 5 spines.

C. minerva has been collected from a variety of hosts, including marsupials, but 88% (22 of 25) of our specimens were collected from *Rhipidomys* species. All of our specimens were collected between 1320 and 1500 meters elevation. This species has been collected at elevations of 3505 and 4033 meters in Peru.

We have included illustrations of specimens collected from the same host species to indicate the variation which occurs in this species.

Genus *Plocopsylla* Jordan

Plocopsylla Jordan, 1931*b*:138.

Type Species: *Craneopsylla achilles* Rothschild.

Plocopsylla ulysses Hopkins

(Fig. 65-67, 68c)

Plocopsylla ulysses Hopkins, 1951:529, Fig. 1-4.—Hopkins and Rothschild, 1956:167-168, Fig. 269-271.—Johnson, 1957:74.

Type Data: Male holotype and female allotype ex *Thomasomys* species, Ecuador: Chimborazo, IV-1931, F. Spillmann collector.

Other Recorded Distribution: None.

Venezuelan Records (23 males and 35 females)

There were 20 males and 32 females ex 10 *Thomasomys laniger* (Mérida and Trujillo), 5 *Thomasomys lugens* (Mérida), 6 *Thomasomys hylophilus* (Mérida), and 1 *Thomasomys* sp.[1] (Mérida). The remaining 6 specimens were collected from *Trachops cirrhosus*[3] (Guárico), *Oryzomys minutus* (Mérida). *Cryptotis thomasi*, *Akodon bogotensis*, and a bird[3] (Táchira).

Remarks

Our specimens appear to be sufficiently different from type specimens to warrant description as a new species. However, Smit (1968) has compared our specimens with the holotype and assures us they are conspecific. Apparently the holotype specimen is overcleared and some aspects of the male terminalia are difficult to see. In our specimens there is a considerable amount of variation and there are some aberrant specimens. For example, there are 2 males and 3 females with spines on the genal process (one side only) and there are 3 additional females with 3 antepygidial bristles on each side. The female allotype and most of our specimens have 4 antepygidial bristles per side. In the male holotype the lateral projection of the clasper is fairly straight and the apex is truncate whereas in our specimens the lateral projection of the clasper is not straight and the apex has the appearance of the head of a railroad spike (somewhat like *P. hector*). Also the movable process of the clasper is not fingerlike as in illustrations given by Hopkins but the apex is more broadly triangular. The eighth sternum is well developed as in *P. scotinomi* but the apical half is filamentous.

All but 3 males and 4 females were collected from species of *Thomasomys*. All of our specimens were collected at elevations in excess of 2300 meters. Of the four species of helmeted fleas in our collection, each representing a different genus, *P. ulysses* is the most ecologically restricted in terms of hosts and elevation.

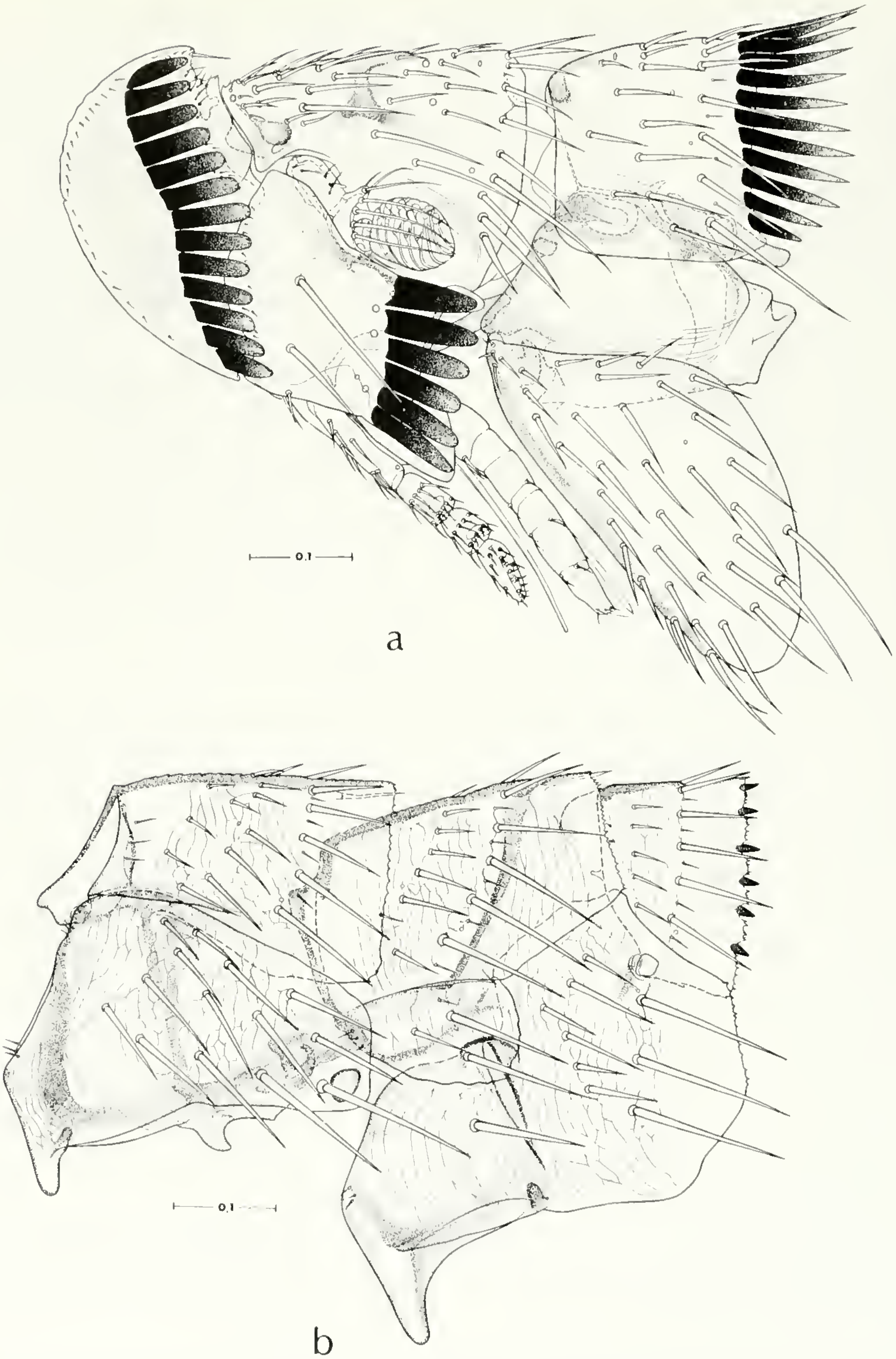


Fig. 61. *Craneopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 546). Dto. Federal. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

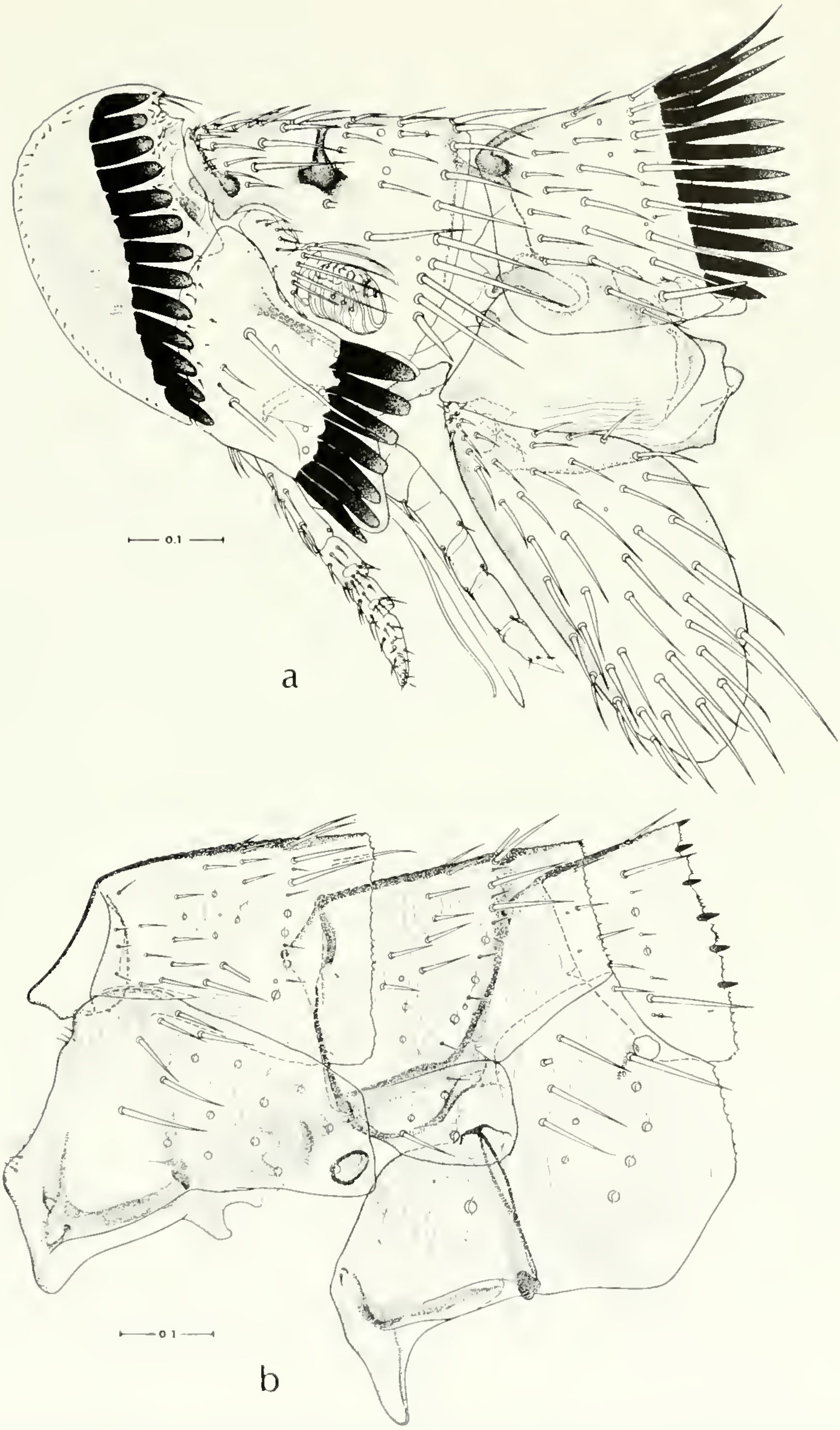


Fig. 62. *Craneopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 342), Dto. Federal. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

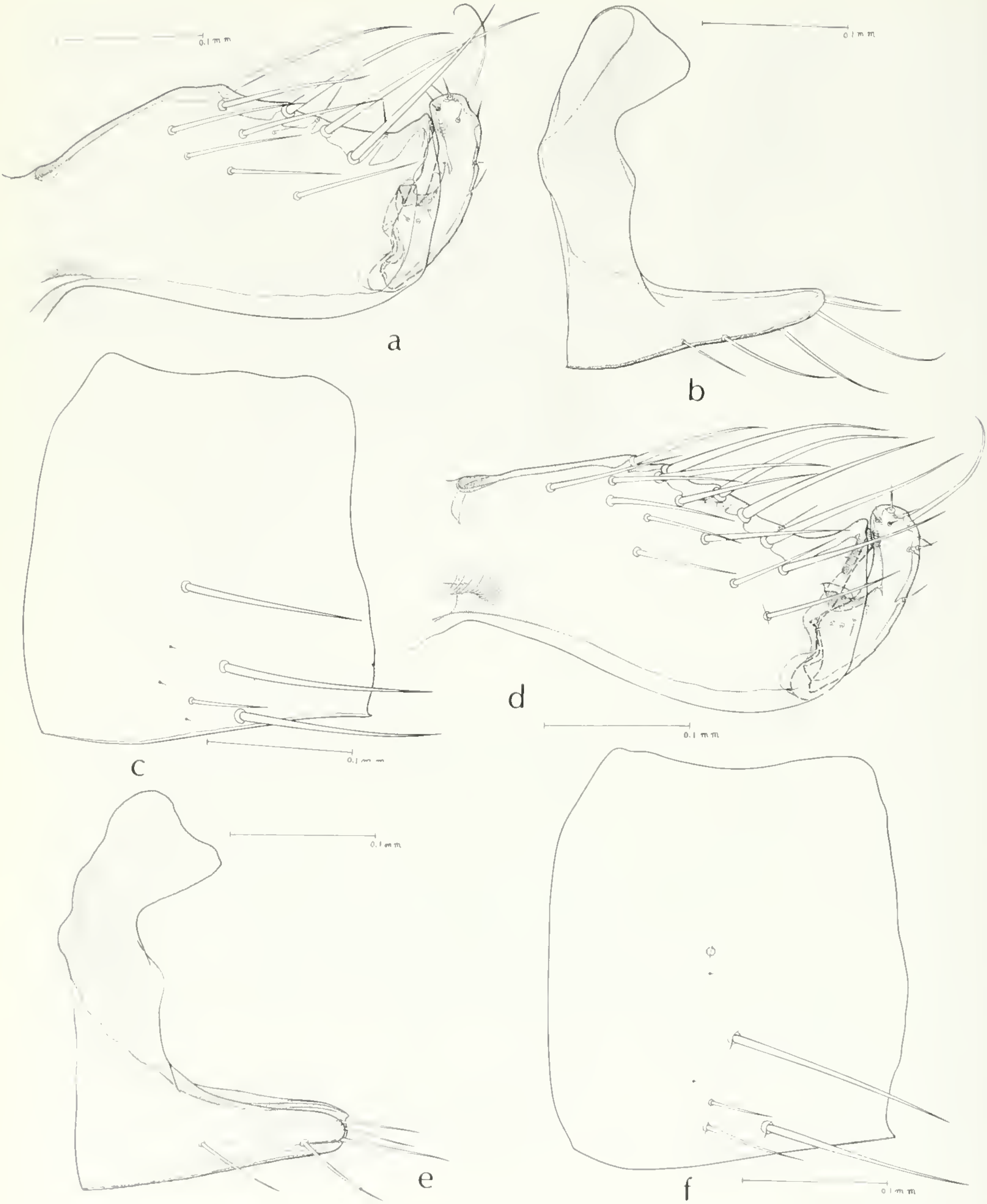

0.1 mm
0.1 mm
a
b
c
0.1 mm
d
0.1 mm
0.1 mm
e
f
0.1 mm

Fig. 63. *Craneopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 546), Dto. Federal. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum. (SVP 342), Dto. Federal. Male: d, process and movable finger of clasper. e, ninth sternum. f eighth sternum.

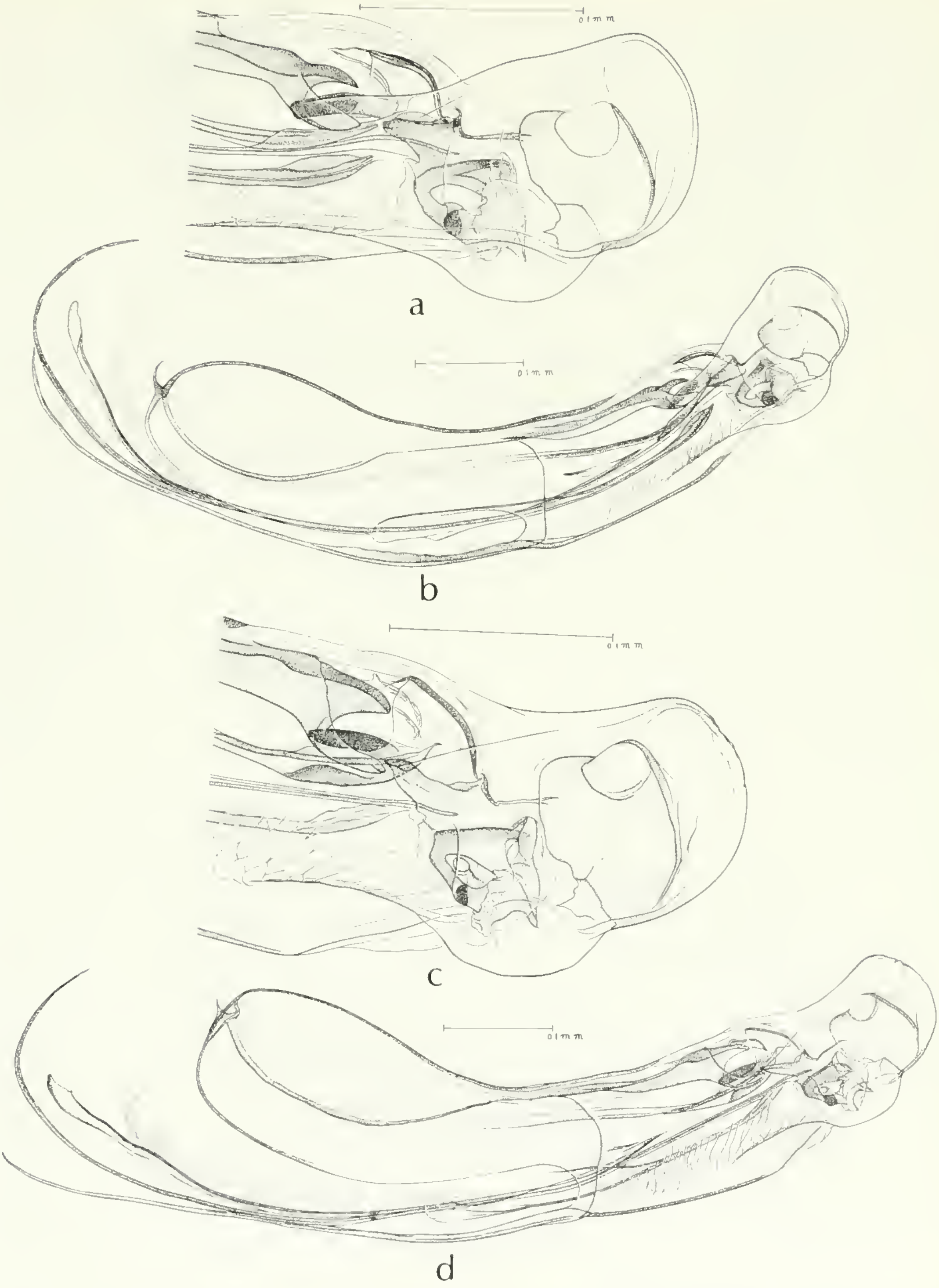


Fig. 64 *Craneopsylla minerva minerva* (Rothschild) ex *Rhipidomys venustus* (SVP 546), Dto. Federal. Male: a, apex of aedeagus. b, aedeagus (SVP 342), Dto. Federal. Male: c, apex of aedeagus. d, aedeagus.

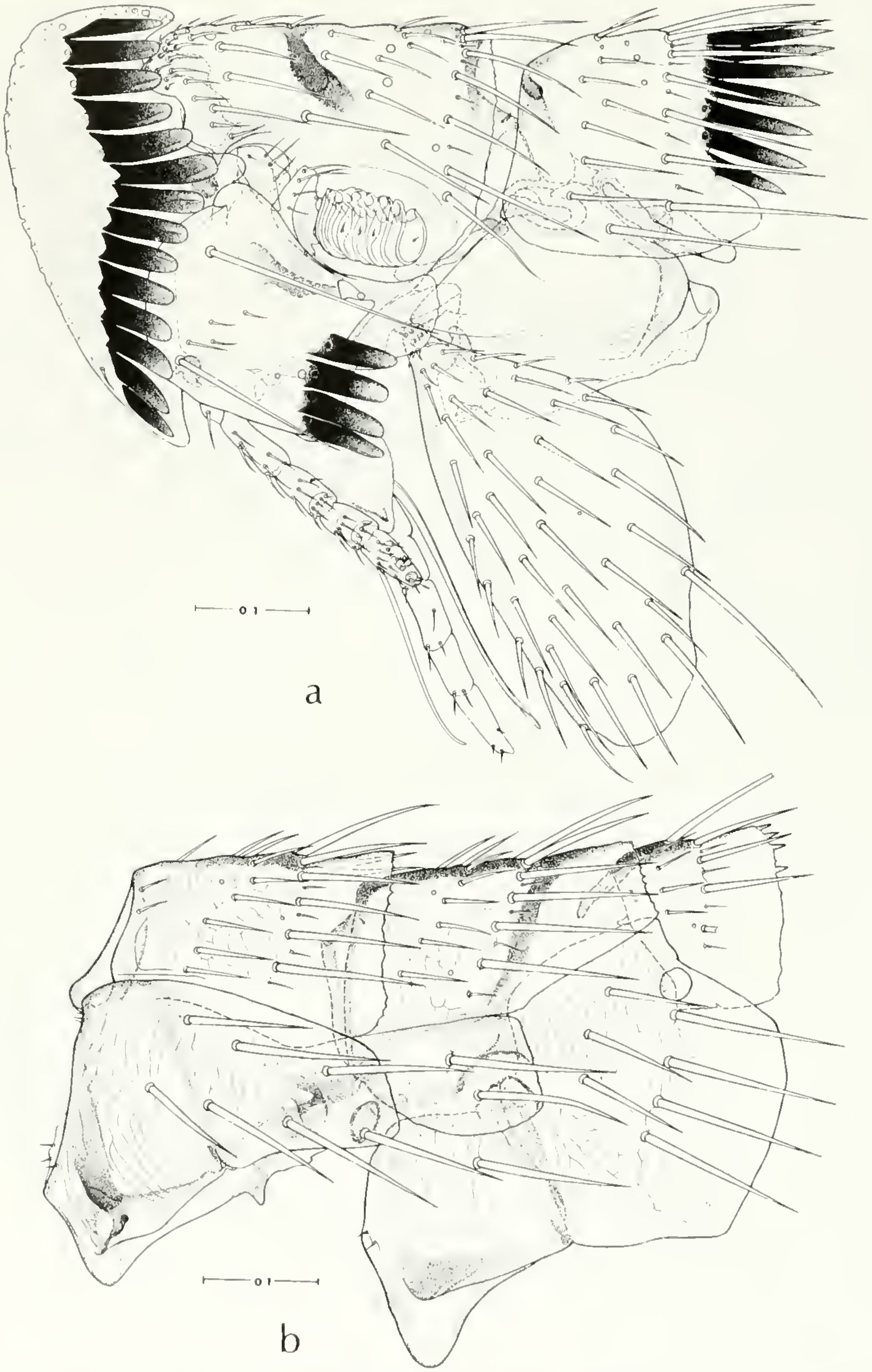


Fig. 65. *Plocopsylla ulysses* Hopkins. Male: a, head, prothorax and procoxa. b meso- and metathorax and first abdominal segment.

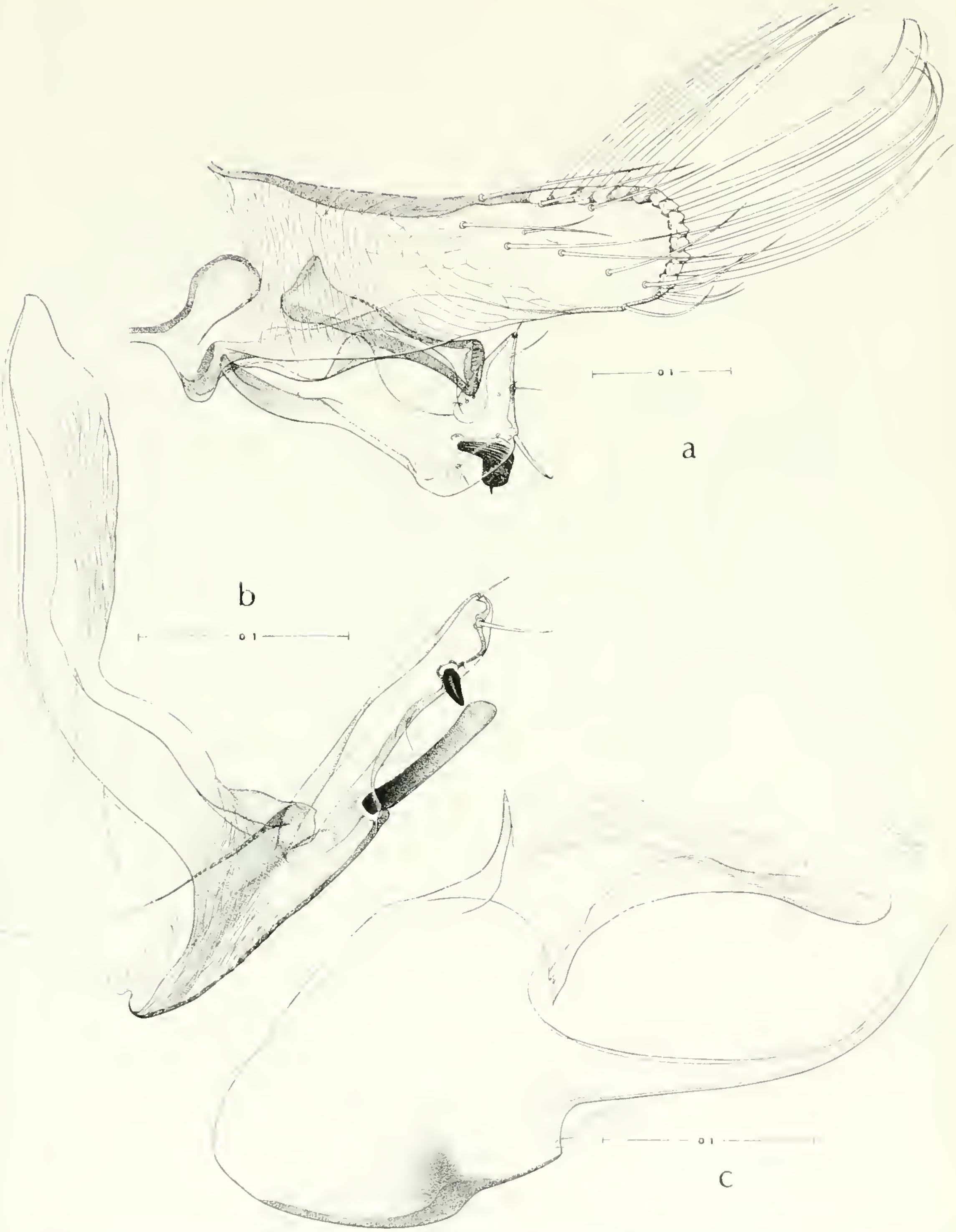


Fig. 66. *Plocopsylla ulysses* Hopkins. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

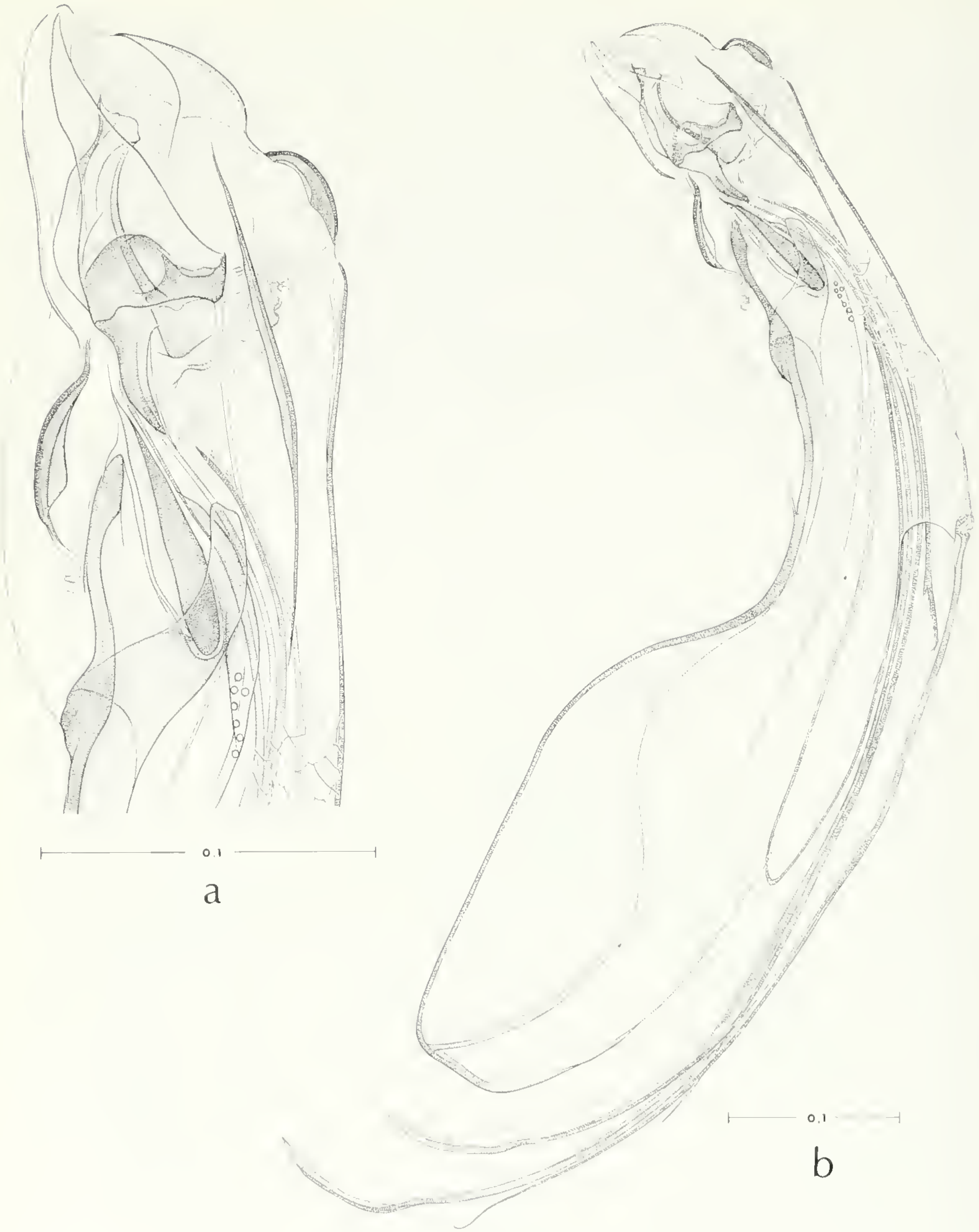


Fig. 67. *Plocopsylla ulysses* Hopkins. Male: a, apex of aedeagus. b, aedeagus.

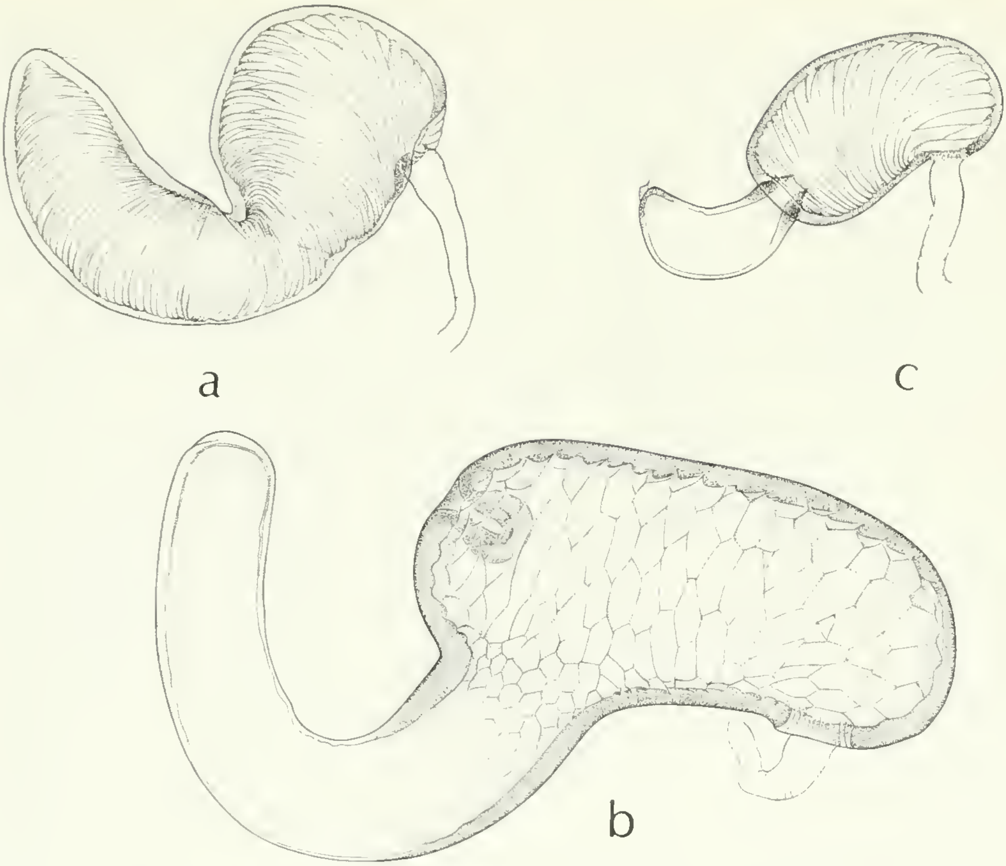


Fig. 68. Females, spermatheca: a, *Cleopsylla monticola* Smit. b. *Craneopsylla minerva minerva* (Rothschild). c, *Plocopsylla ulysses* Hopkins.

Genus *Sphinctopsylla* Jordan

Sphinctopsylla Jordan, 1931*b*:141.

Type Species: *Craneopsylla tolmera* Jordan.

Sphinctopsylla tolmera (Jordan)
(Fig. 69-71)

Craneopsylla tolmera Jordan, 1931*a*:314, Fig. 5.

Sphinctopsylla tolmera, Jordan, 1931*b*:141, Fig. 10.—Smit, 1955:324.—Johnson, 1957:69.

Type Data: Male holotype ex *Neomys*[5] species, Ecuador: Prov. of Pichincha, 23-XII-1930, F. Spillmann collector.

Other Recorded Distribution: Ecuador: ex *Oryzomys* species and *Thomasomys* species. Colombia: ex *Chilomys instans* and *Thomasomys laniger*.

Venezuelan Records (36 males and 76 females)

There were 32 males and 63 females ex 38 *Oryzomys minutus* in Mérida at 3122-3785 meters elevation and 8 *O. minutus* in Táchira at 2370-2418 meters elevation. An additional 4 males and 13 females were collected from *Thomasomys laniger* and *Akodon bogotensis* (Mérida); *Oryzomys albigularis, Caenolestes obscurus, Rhipidomys venustus*, and *Thomasomys hylophilus* (Táchira), and *Oryzomys fulvescens* (Táchira and Yaracuy). Also there were 4 specimens for which the host data and locality had been lost.

Remarks

Hopkins and Rothschild (1956) indicate there are 15 spines in the helmet comb, 5 spines in the genal comb and 30 spines in the pronotal comb. All of our specimens have 17 spines in the helmet comb, 5 spines in the genal comb and 30 spines in the pronotal comb with the following exceptions: helmet comb—there are 12 males and 5 females with 16 spines, and 1 male and 3 females with 18 spines; pronotal comb—4 males and 6 females have 28 spines, 4 males and 11 females have 32 spines, and 3 females have 34 spines. There may not be as much variation in the pronotal comb as our counts indicate because the orientation of some specimens makes accurate counting difficult.

Our specimens were collected between 2370 and 3785 meters elevation, but more than 80%

---

[5] This is probably an error as *Neomys* does not occur in the new world

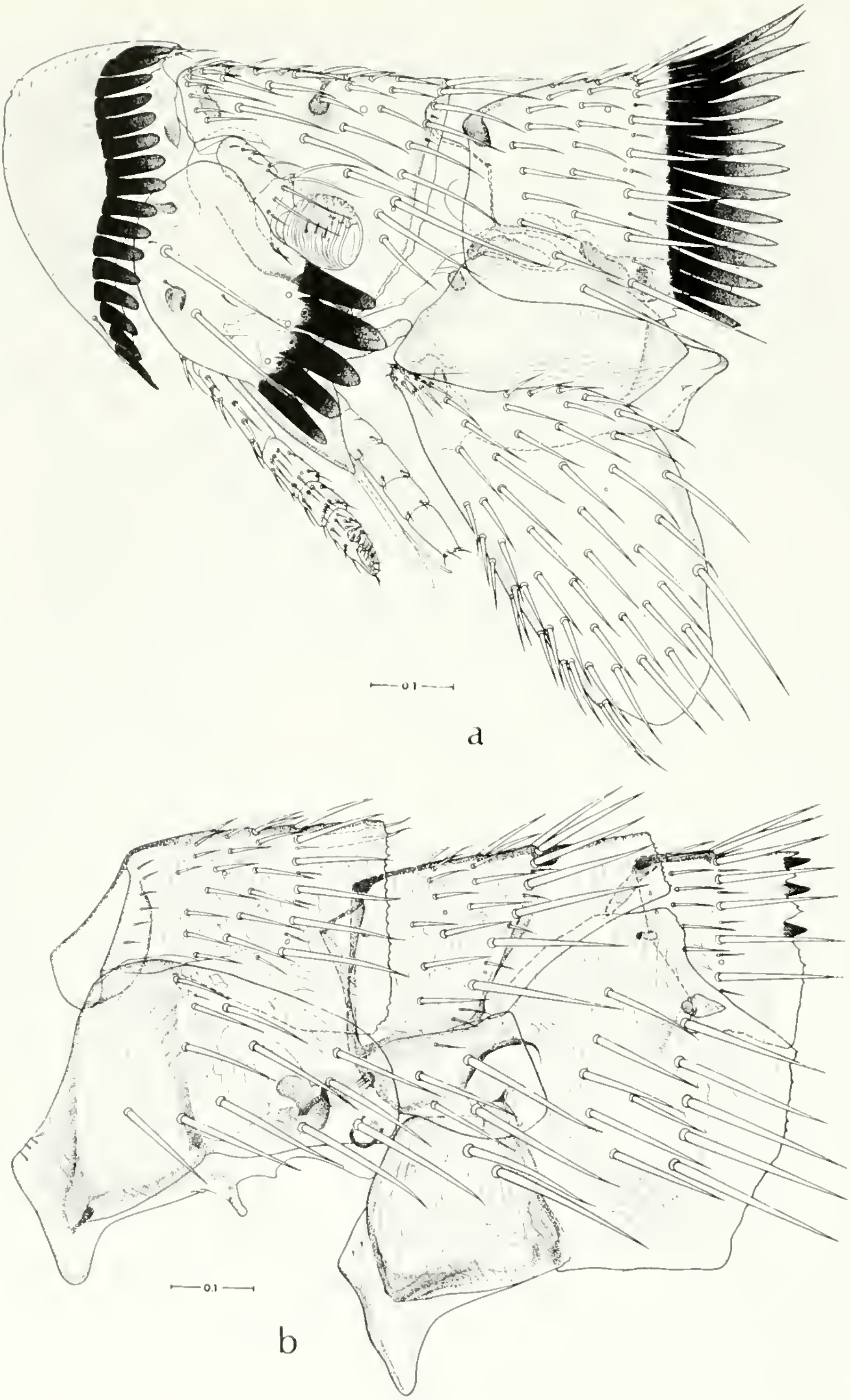


Fig. 69. *Sphinctopsylla tolmera* (Jordan). Male. a. head prothorax and procoxa. b. meso- and metathorax and first abdominal segment.

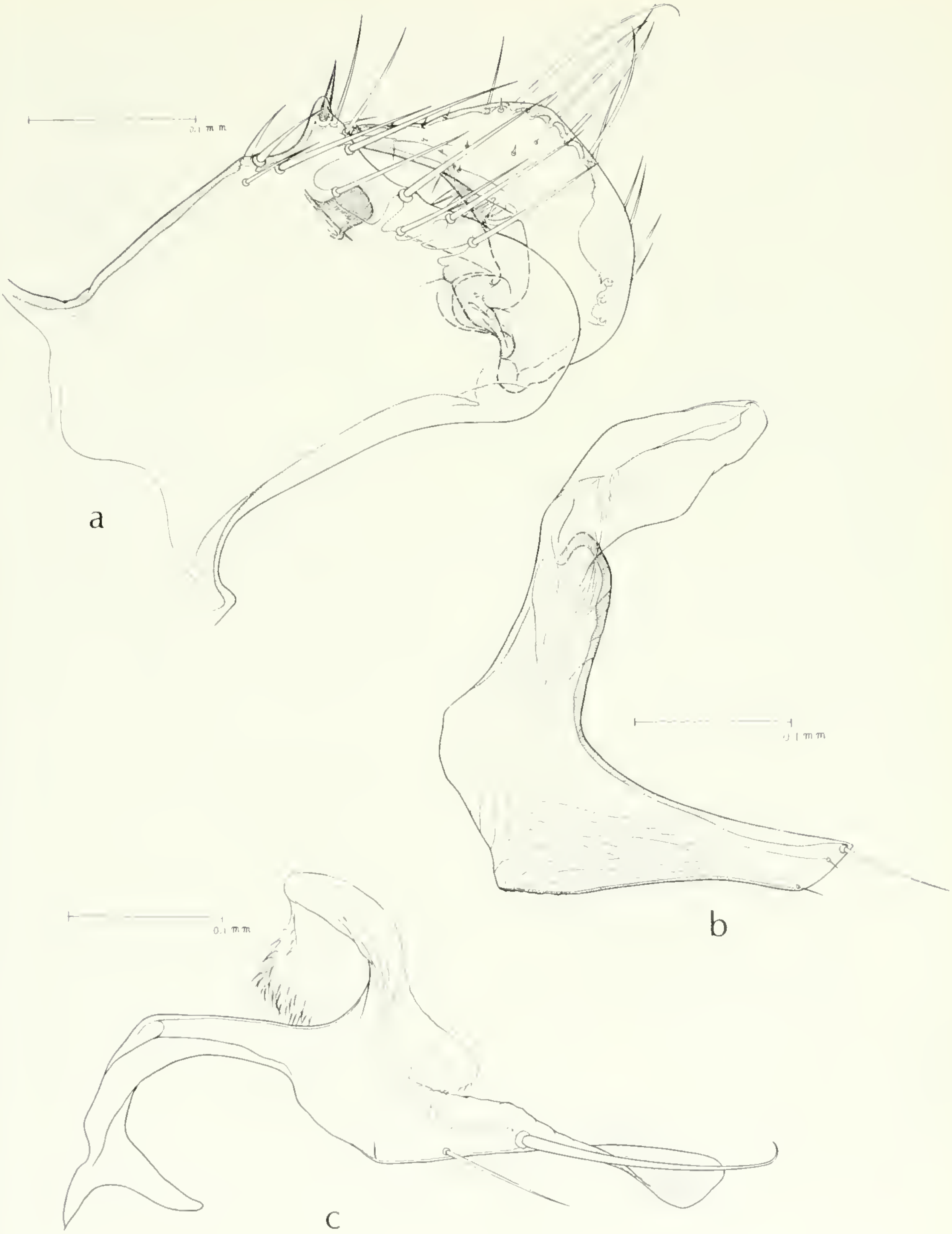


Fig. 70. *Sphinctopsylla tolmera* (Jordan). Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

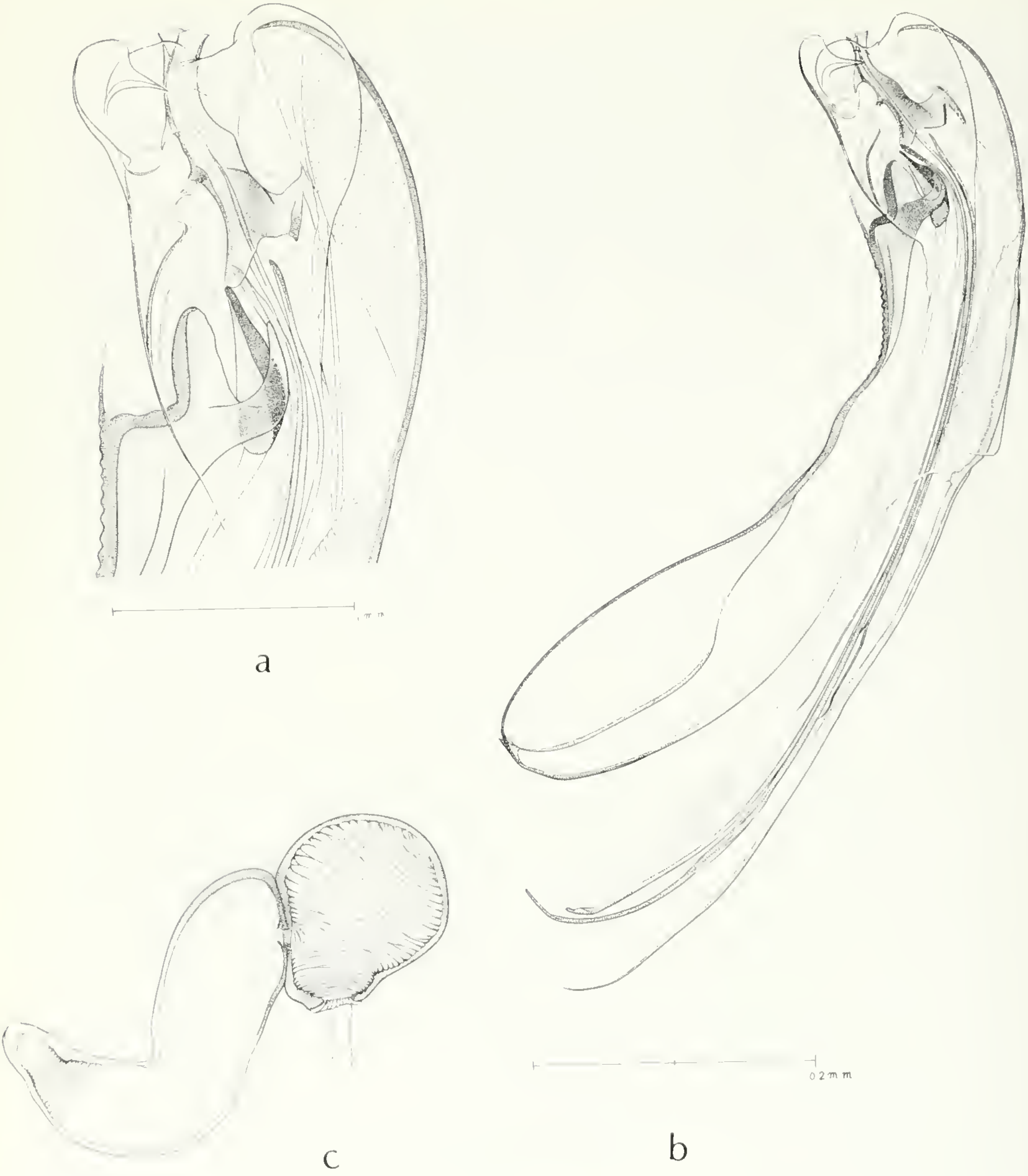


Fig. 71 *Sphinctopsylla tolmera* (Jordan). Male: a, apex of aedeagus. b, aedeagus. Female: c, spermatheca.

were collected over 3000 meters elevation. Although *S. tolmera* has been collected from several host genera, more than 87% of our specimens were collected from *Oryzomys* species, principally *O. minutus*.

Family Ischnopsyllidae

Genus *Hormopsylla* Jordan and Rothschild

Hormopsylla Jordan and Rothschild, 1921*b*:158.

Type species: *Ceratopsylla fosteri* Rothschild.

Hormopsylla cryptica, new species

(Fig. 72-74)

DIAGNOSIS

Hormopsylla cryptica, new species, is very near *H. fosteri* (Rothschild) but the male genitalia differs considerably. In the eighth sternum the apex is truncate, not rounded; there is a well-developed proximal lobe (resembling the proximal lobe of the ninth sternum characteristic of species in other families) shaped like a fishtail; the movable process of the clasper is broadly truncate rather than triangular and the shapes of the crochet and median dorsal lobe are quite different in the two species.

DESCRIPTION

Head (Fig. 72a): Anterior margin evenly rounded; preantennal area covered with about 48 short, spiniform bristles plus four longer bristles; prominent mesal sclerotization running parallel with anterior margin of head; vertical incrassation extending ventrad from dorsal margin. Two genal teeth; anterior tooth broad, about two-thirds length of narrower tooth; preoral tuber distinct. Genal process long, extends well beyond apex of antenna; reticulate; apex rounded. Eye small, lightly pigmented, scarcely discernible. Postantennal area with 5 bristles; 4 vertical incrassations between rows of bristles, middle 2 most pronounced, apices globular; diagonal row of bristles along antennal fossa; pale, mesal, triangular area with 5 fairly long and 2 or 3 smaller bristles.

Thorax (Fig. 72a, b): Pronotum with 3 rows of bristles arranged 4-3-5; last row with ventral bristle much longer than others, with 5 intercalaries; about 24 teeth in pronotal comb which curves cephalad on ventral end. Mesonotum with 6 rows of bristles, 3 to 4 bristles per row; 5 prominent vertical incrassations extending ventrad from dorsal margin. Mesepimere with mesal row of 3 long bristles; about 5 additional smaller bristles. Mesepisternum divided by broad horizontal band; 1 long, 5 shorter bristles above band; lower portion devoid of setae. Metanotum with 5 dorsal incrassations; 4 rows of marginal—submarginal bristles plus 2 moderately long and 2 short bristles; apex with comb of about 7 teeth per side.

Legs: Procoxa with about 36 mesal bristles plus marginals; 1 long bristle in caudoventral angle; profemur with 3 small bristles on outer lateral surface. Meso-, metacoxae with heavily sclerotized internal rods. Hind tibia with 8 dorsocaudal notches with bristles arranged 2-2-1-2-2-1-2-2. Tarsal segment lengths in microns: 155, 125, 98, 60, 112; 4 pairs lateral plantar bristles.

Abdomen: Terga 1-4 with well-developed combs with teeth numbering 20-18-16-16; 5 bristles per segment, ventral pair with spiracle between them. Minute bristle at base of single, long antepygidial bristle. Sterna with darkened, heavily sclerotized areas near ventral margins; 1 bristle per sternum.

Modified Abdominal Segments, Male (Fig. 73): Tergum 8 with 4 stout bristles caudad of sensilium; caudal margin rounded. Sternum 8 with well-developed caudal process bearing about 6 medium bristles plus 7 or 8 small bristles on ventral margin; apex subtruncate, undulating dorsal margin; striated; appears to have longitudinal fold with well-developed proximal arm, apex like a fishtail. Distal arm of ninth sternum (DA9) with lobe on caudoventral margin bearing 1 short seta; apex funnellike; 2 small marginal setae plus 1 mesal bristle about midway between lobe and apex; dorsal margin concave. Immovable process of clasper (P.) broadly truncate; apex reaches dorsad of midpoint of movable process of clasper (F.); F. prominent, with 2 medium bristles on or near dorsal margin plus 9-10 smaller mesal bristles; point of articulation with P medial.

Aedeagus (Fig. 74): Aedeagal apodeme long, slender, swordlike; with upturned, acuminate apex; proximal spur prominent; apex angular. Median dorsal lobe ovoid, membranous flap somewhat troughlike. Lateral lobes with ventrocaudal margin rounded. Crochet very broad basally; width reduced abruptly at apex, slightly sinuous, acuminate.

Type Data: Male holotype ex *Eptesicus brasiliensis* (SVP 6634); T. F. Amazonas, 84 km SSE Esmeralda near Boca Mavaca, 185 m elev.; 13-II-1966; Tuttle team collector. One paratype male ex *Tadarida gracilis* (SVP 6657) same locality and collectors but 16-II-1966. One paratype male ex *Molossus major* (SVP 9290); Bolívar, 59 km SE El Dorado near El Manaco, 150 m elev., 13-VI-

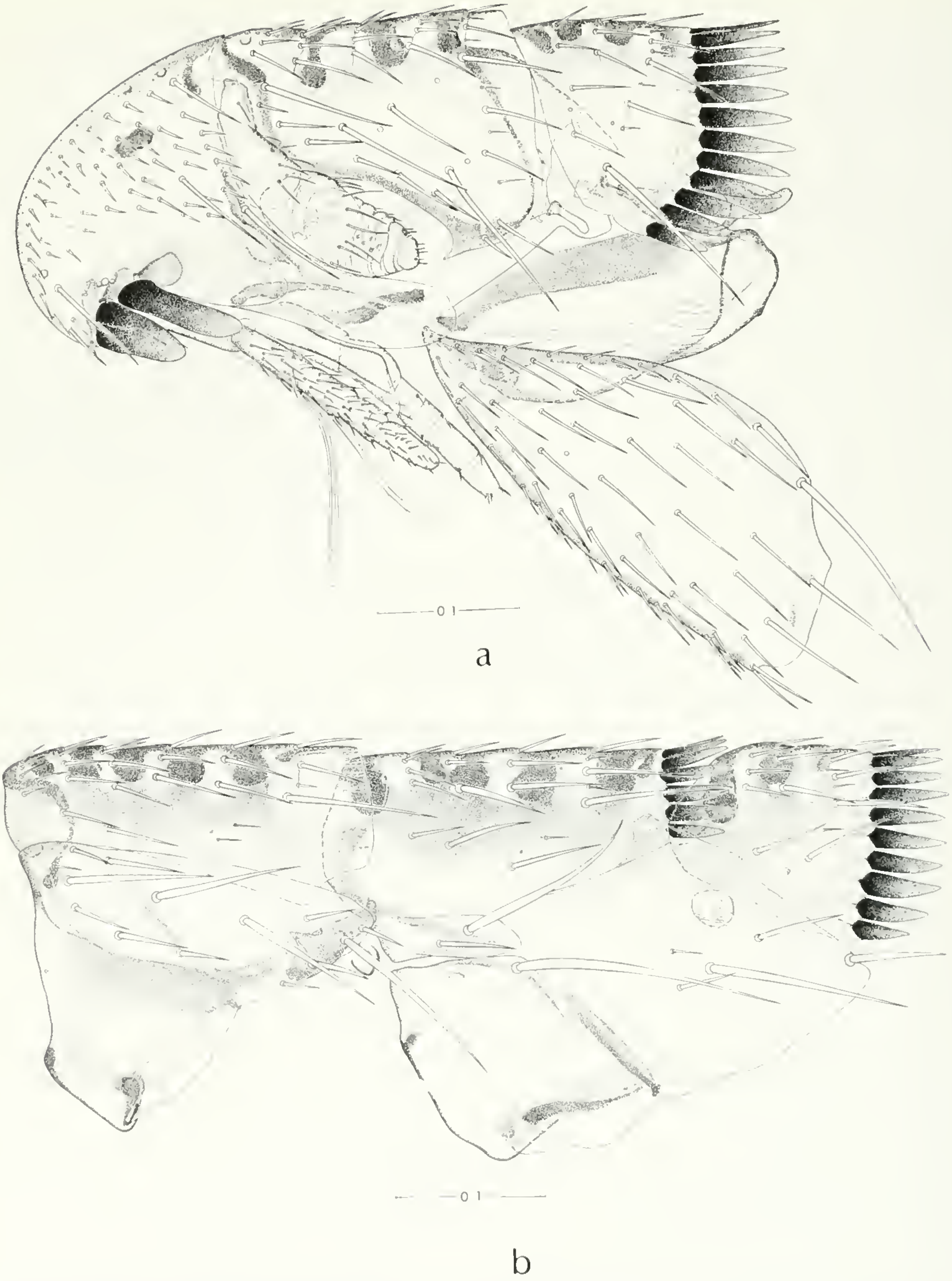


Fig. 72. *Hormopsylla cryptica,* new species. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

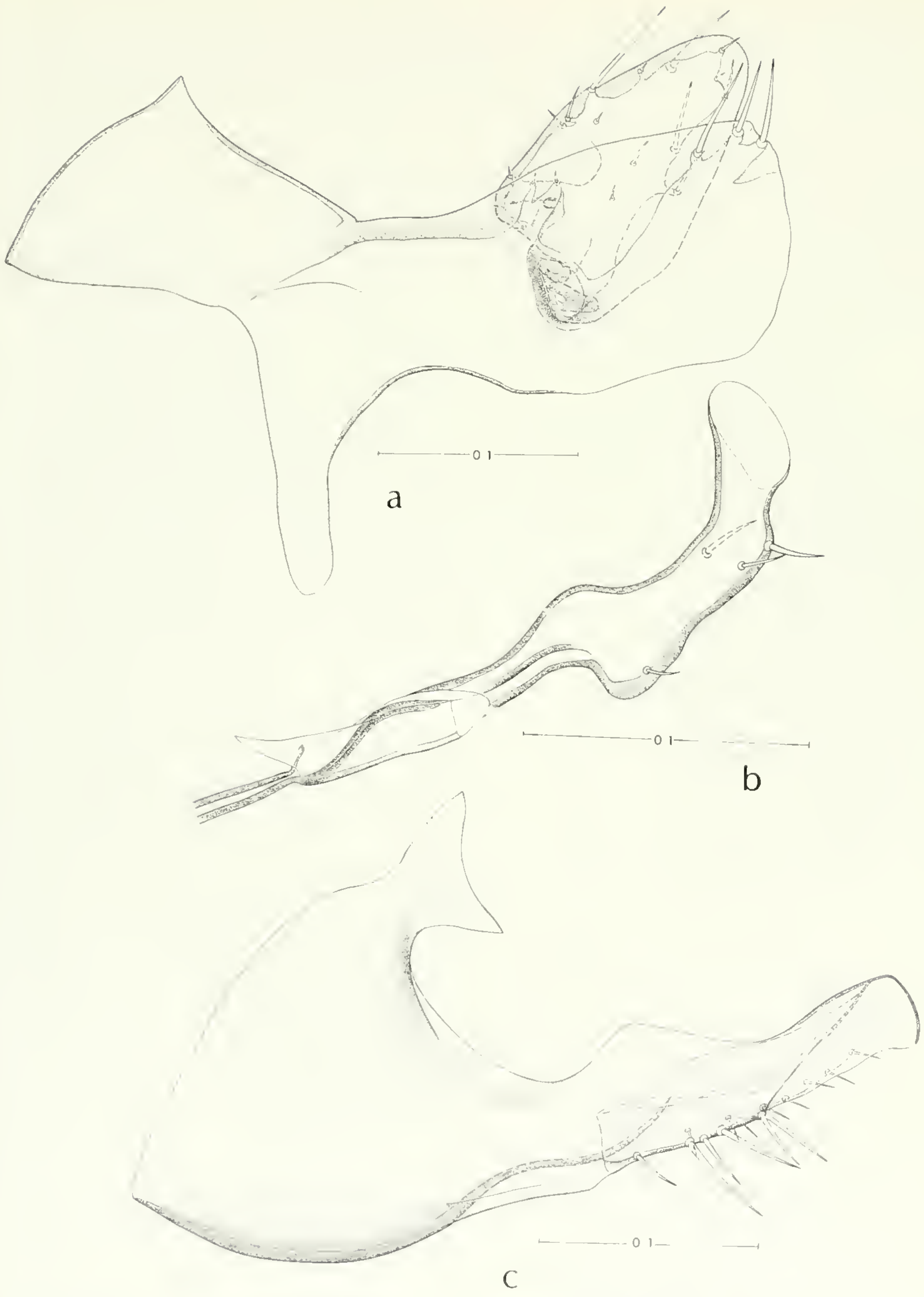


Fig. 73. *Hormopsylla cryptica,* new species. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

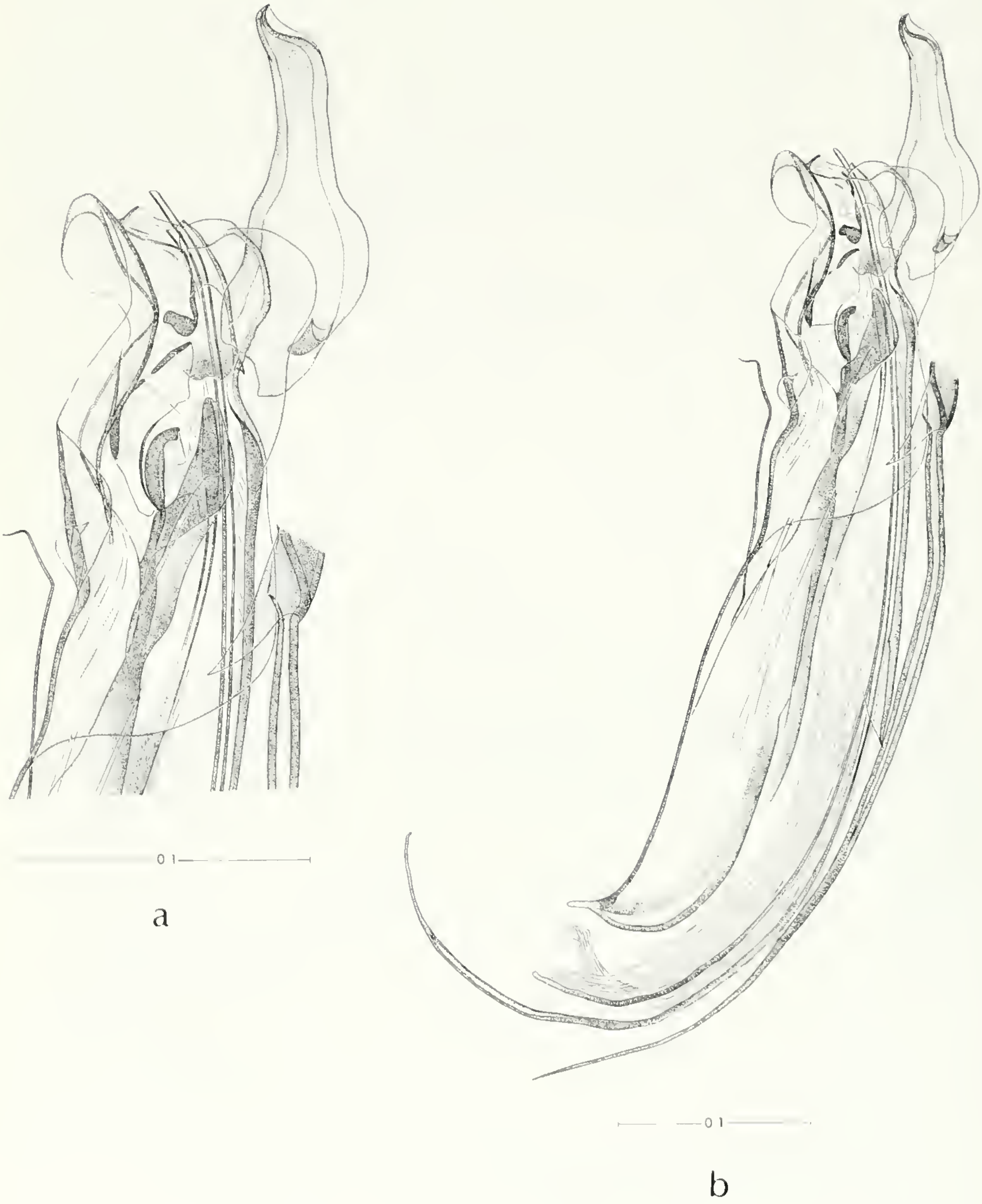


Fig. 74. *Hormopsylla cryptica*, new species. Male: a, apex of aedeagus. b, aedeagus.

1966; Tuttle team collector. Holotype deposited in the collection of the U. S. National Museum, one paratype in the British Museum and one paratype in the collection of the junior author.

Genus *Myodopsylla* Jordan and Rothschild

Myodopsylla Jordan and Rothschild, 1911:88.

Type Species: *Ceratopsylla insignis* Rothschild

Myodopsylla wolffsohni salvasis Jordan
(Fig. 75-78)

Myodopsylla wolffsohni salvasis Jordan, 1931*c*: 264, Fig. 1.—Guimarães, 1940:220, Fig. 1.—Hopkins and Rothschild, 1956:241-242, Fig. 400; Pl. 18f, 26.—Johnson, 1957:97.—Barrera and Diaz-Ungria, 1957:164, 181.—Machado-Allison, 1966:26, 28.

Type Data: Male holotype ex "bat," Venezuela: State of Mérida, VI-1930, A. Hase collector; 1 male and 3 females ex *Myotis* species, Puerto La Cruz, (6 miles NNE Barcelona), VI-1930, A. Hase collector.

Other Recorded Distribution: None.

Venezuelan Records (9 males and 32 females)

There were 4 males and 23 females ex 4 *Myotis keaysi* in Aragua and 7 *M. keaysi* in Miranda. Fourteen specimens were collected from 2 *Myotis oxyotis* in Mérida and 3 *Myotis nigricans* in Monagas.

Remarks

All of our specimens of *M. wolffsohni salvasis* were collected above 950 meters, primarily on bats of the genus *Myotis*, especially *M. keaysi* and to a lesser extent on *M. nigricans* and *M. oxyotis*. The degree of sclerotization of the crochet is variable which probably influences folding and distortion of this structure and causes it to be highly variable in form. The apical lobe of the distal arm of the ninth sternum also tends to be variable. There are 10-12 bristles on the apical margin of the eighth sternum, but in most specimens there are 12.

Genus *Ptilopsylla* Jordan and Rothschild

Ptilopsylla Jordan and Rothschild, 1921*b*:158-160.

Type Species: *Ptilopsylla leptina* Jordan and Rothschild.

Ptilopsylla leptina Jordan and Rothschild

Ptilopsylla leptina Jordan and Rothschild, 1921*b*: 160-162, Fig. 142-147.— Guimarães, 1942: 202.—Costa Lima and Hathaway, 1946:175.—Hopkins and Rothschild, 1956:206, Fig. 351-356.—Johnson, 1957:98.

Type Data: Male holotype ex "bat," Paraguay: Santissma Trinidad (suburb of Asunción), L. Zurcher collector.

Other Recorded Distribution: Brazil: ex *Darias albiventer* (=*Noctilio labialis albiventer*) and *Tadarida europs* (=*T. gracilis*).

Venezuelan Records (1 male)

One male (SVP 15707) ex *Tadarida gracilis*, near Belén and Río Cunucunuma, T. F. Amazonas, 185 m elev., 13-I-1967, Tuttle team collector.

Remarks

P. leptina is said to be "rare" as it has been collected only on four occasions, including our single specimen collection. We have examined several hundred molossid bats but only one was parasitized with this flea. Molossid bats often roost in the space between roof tile and the ceiling and thus are very close to guano deposits. We suggest that fleas of the genus *Ptilopsylla* have adapted to this habitat and are on the host only for short periods while feeding.

Genus *Rothschildopsylla* Guimarães

Rothschildopsylla Guimarães, 1953:109-110.

Type Species: *Ischnopsyllus noctilionis* Costa Lima.

Rothschildopsylla noctilionis (Costa Lima)
(Fig. 79-82)

Ischnopsyllus noctilionis Costa Lima, 1920:56, Fig. 1-2.

Hormopsylla noctilionis, Pinto, 1930:357.—Costa Lima, 1938:186.—Costa Lima and Hathaway, 1946:172.

Ptilopsylla noctilionis, Hopkins, 1952:364.

Rothschildopsylla noctilionis, Guimarães, 1953: 109-110.—Hopkins and Rothschild, 1956:210-211, Fig. 359-361; Pl. 21A.—Johnson, 1957: 99.—Machado-Allison, 1966:28.

Type Data: Ex *Noctilio albiventer* Spix (=*N. labialis albiventer*), Brazil: State of Mato Grosso, Corumba, A. de Miranda Ribeiro collector.

Other Recorded Distribution: None.

Venezuelan Records (1 male and 2 females)

One female (SVP 6598) ex *Tadarida gracilis*, Boca Mavaca, 84 km SSE Esmeralda, Amazonas, 185 m elev., 14-II-1966, Tuttle team collector. One male (SVP 6657) and 1 female (SVP 6658) ex *Tadarida gracilis*, same locality but 16-II-1966.

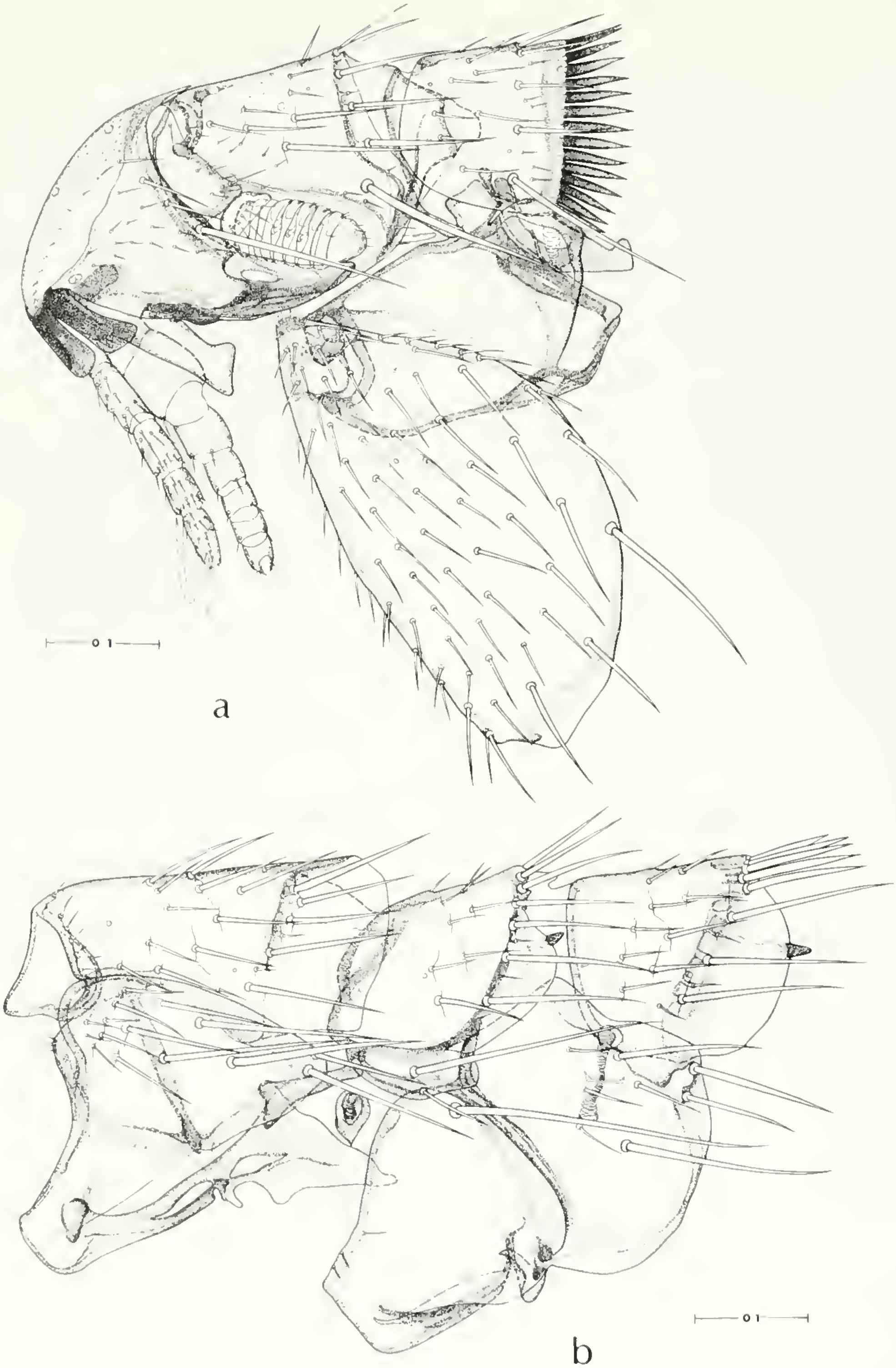


Fig. 75. *Myodopsylla wolffsohni salvasis* Jordan. Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

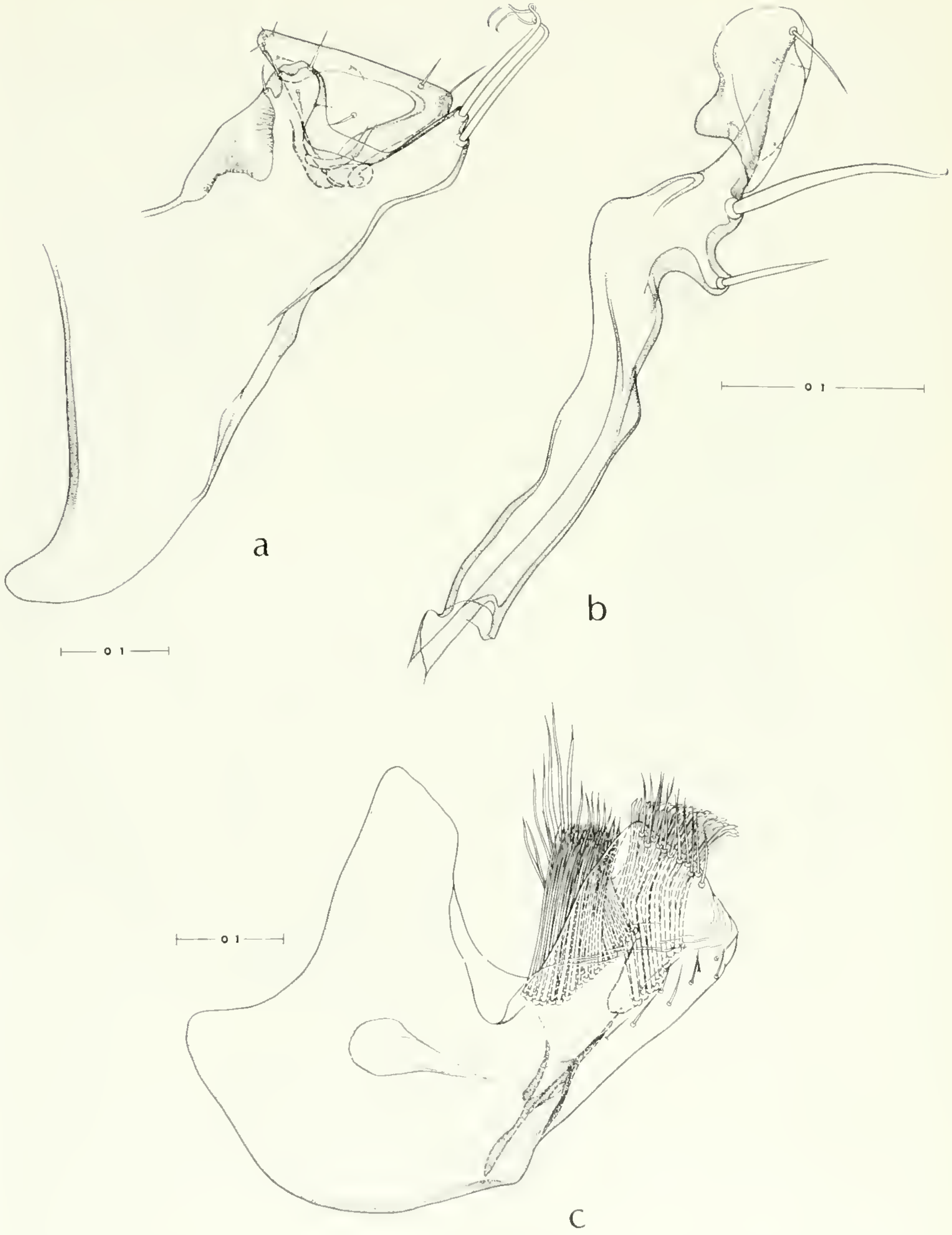


Fig. 76. *Myodopsylla wolffsohni salvasis* Jordan. Male: a, process and movable finger of clasper. b, ninth sternum. c, eighth sternum.

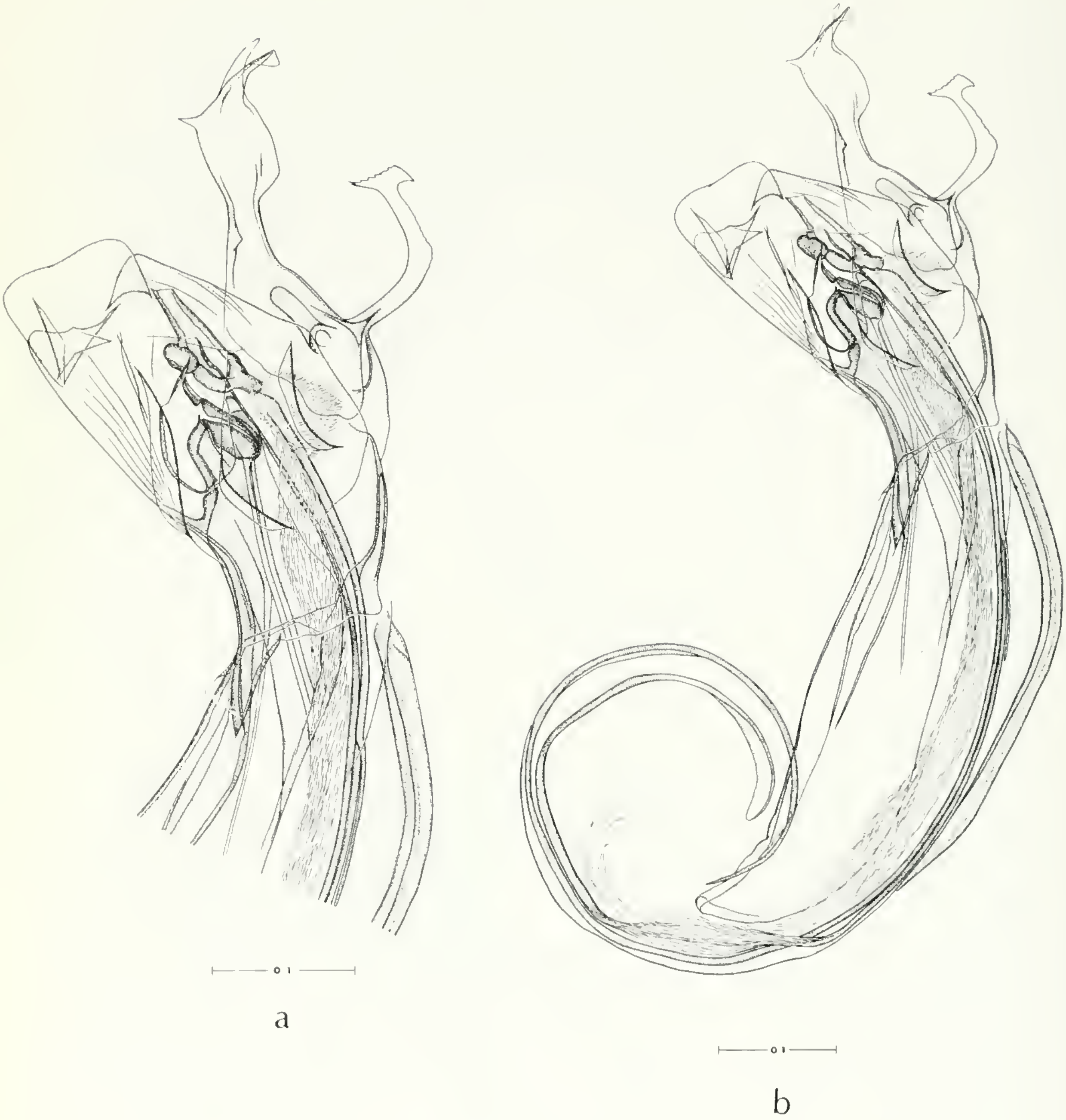


Fig. 77. *Myodopsylla wolffsohni salvasis* Jordan. Male: a, apex of aedeagus. b, aedeagus.

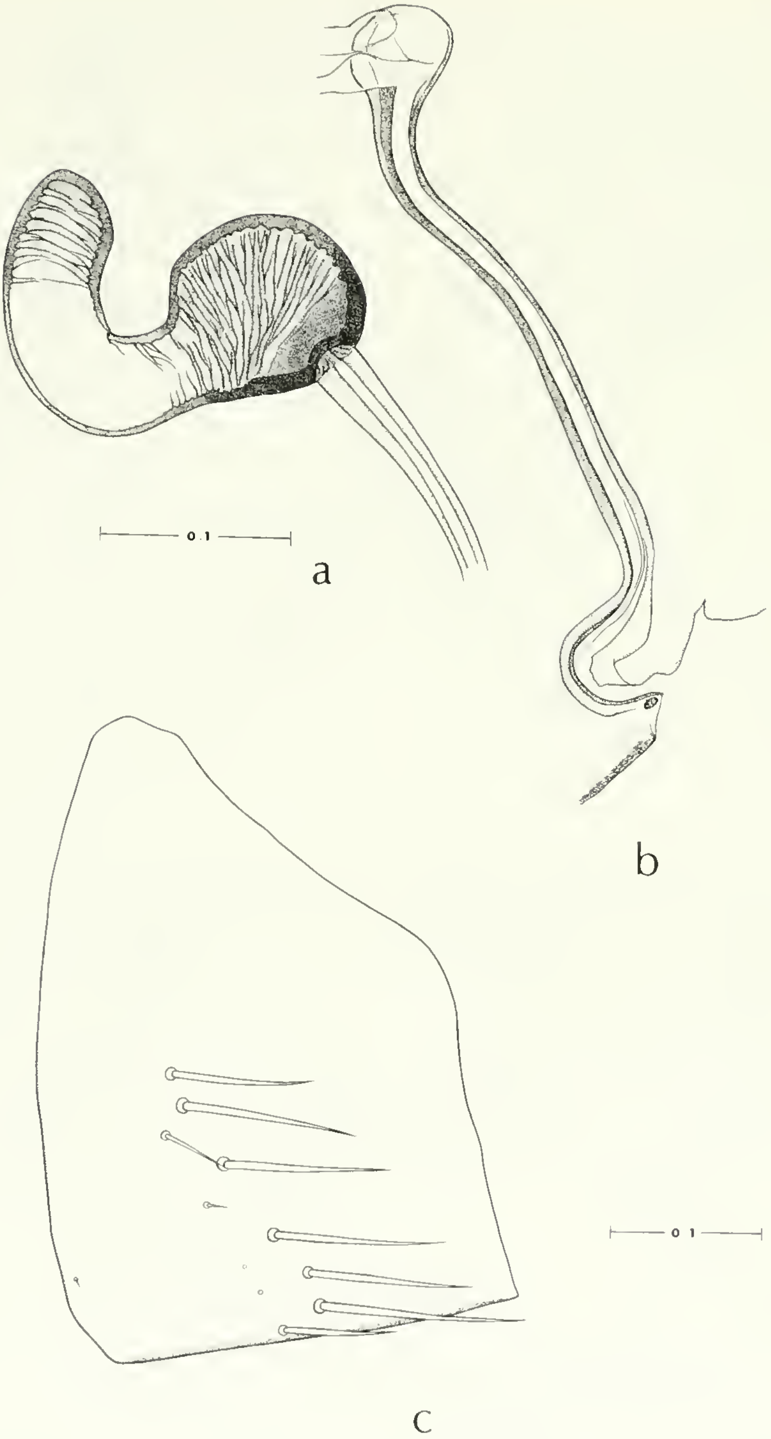


Fig. 78. *Myodopsylla wolffsohni salvasis* Jordan. Female: a, spermatheca. b, bursa copulatrix. c, seventh sternum.

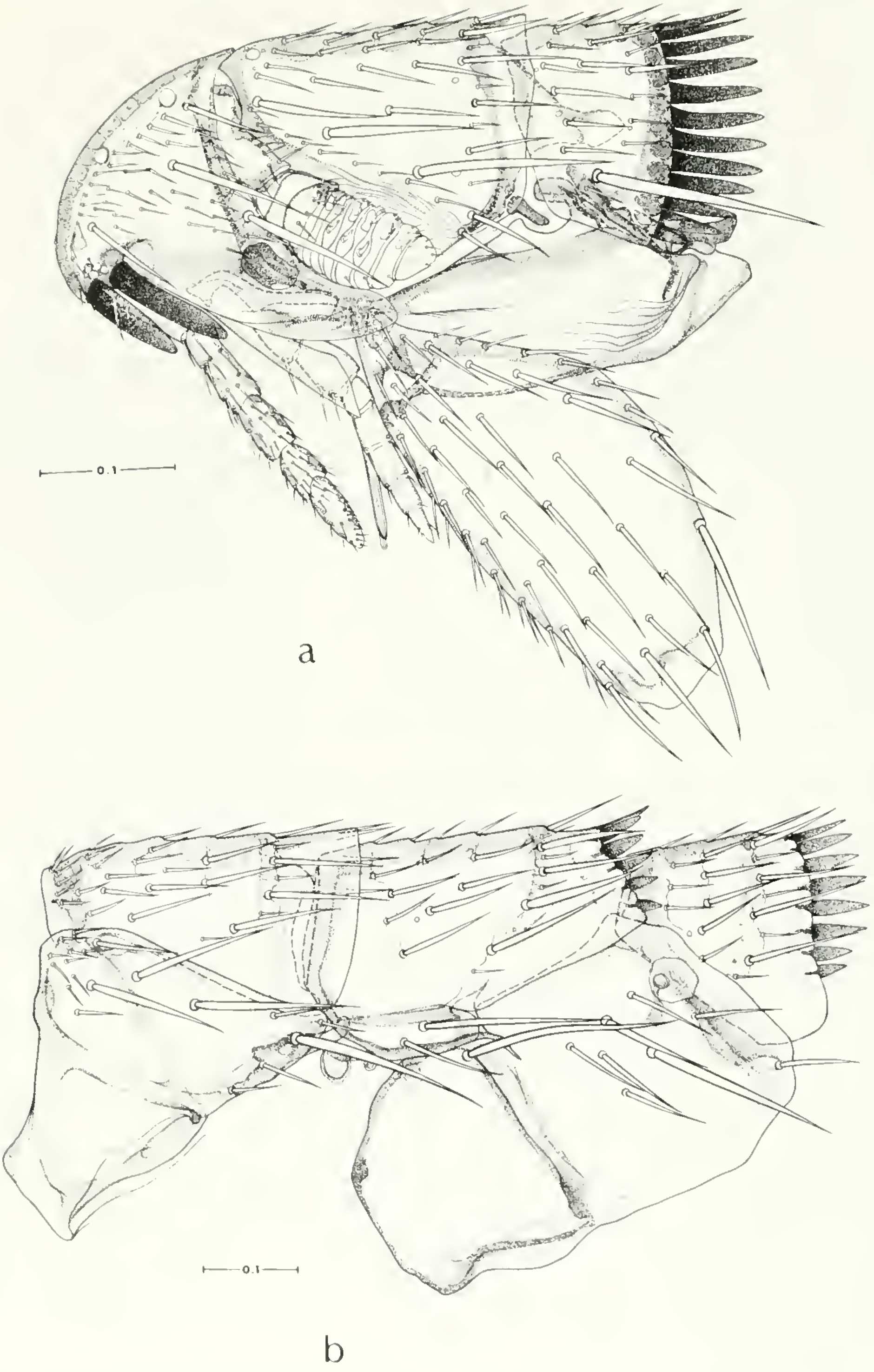


Fig. 79. *Rothschildopsylla noctilionis* (Costa Lima). Male: a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

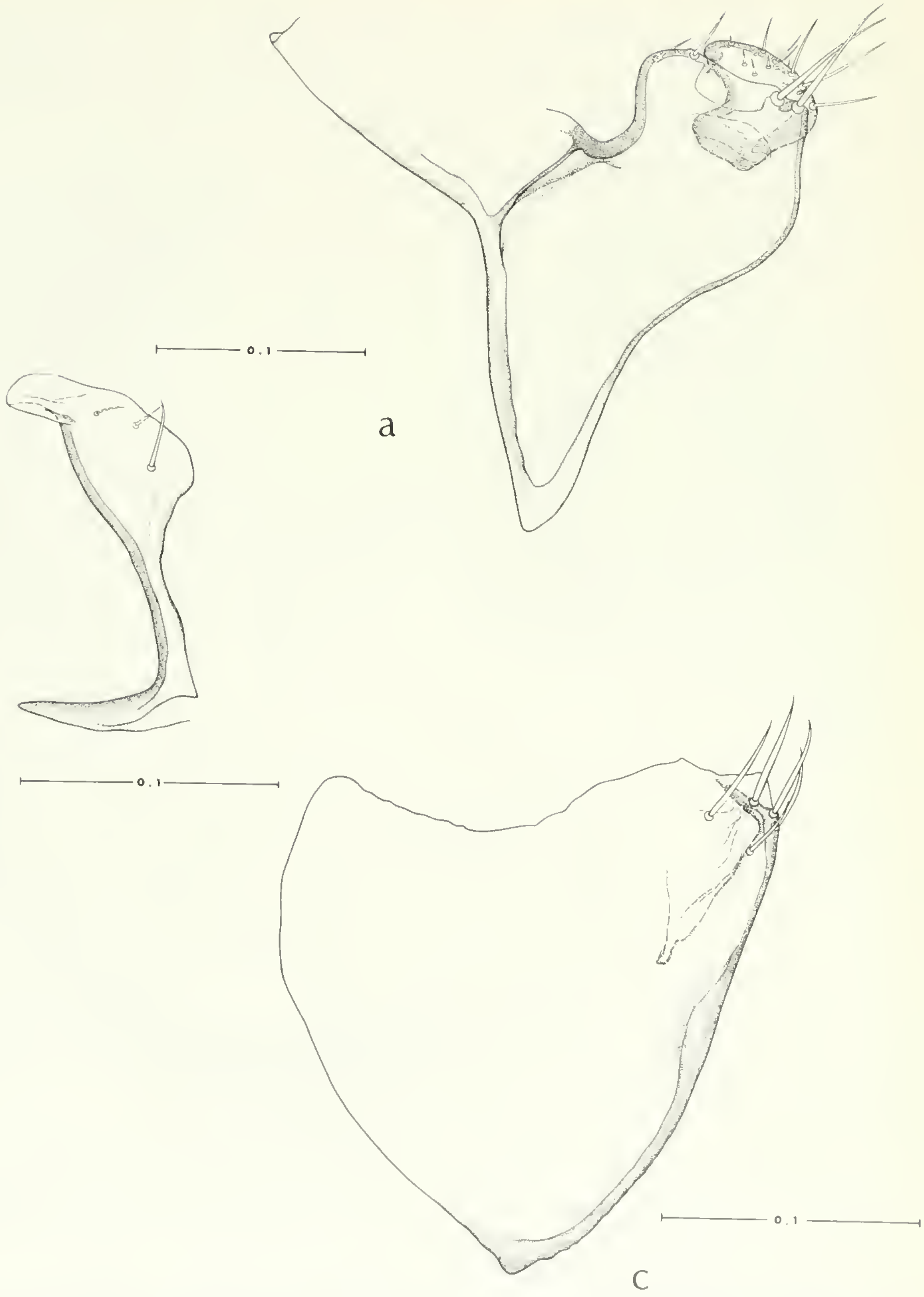


Fig. 80. *Rothschildopsylla noctilionis* (Costa Lima). Male: a, process and movable finger of clasper, b, ninth sternum, c, eighth sternum.

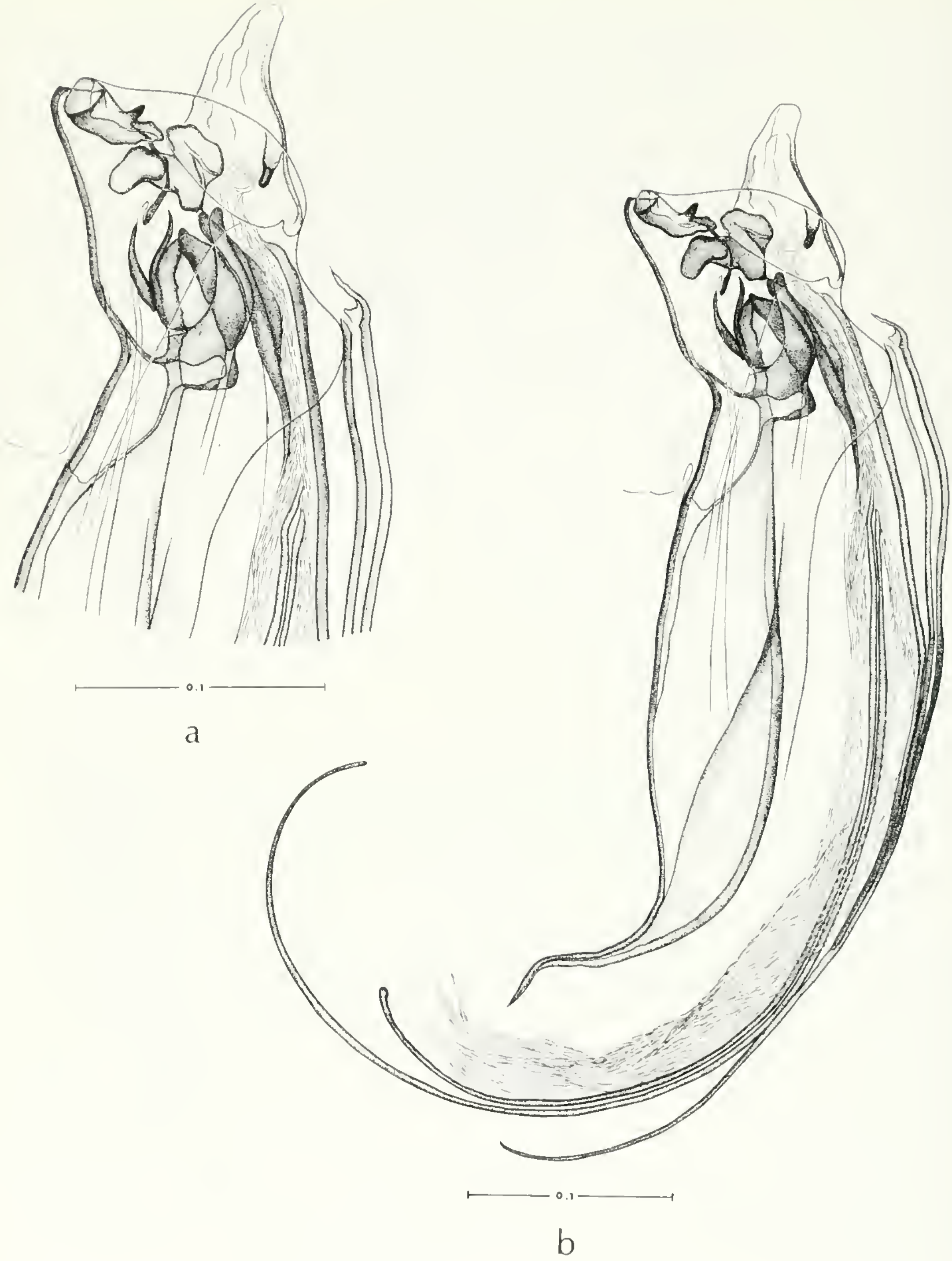


Fig. 81. *Rothschildopsylla noctilionis* (Costa Lima). Male: a, apex of aedeagus, b, aedeagus.

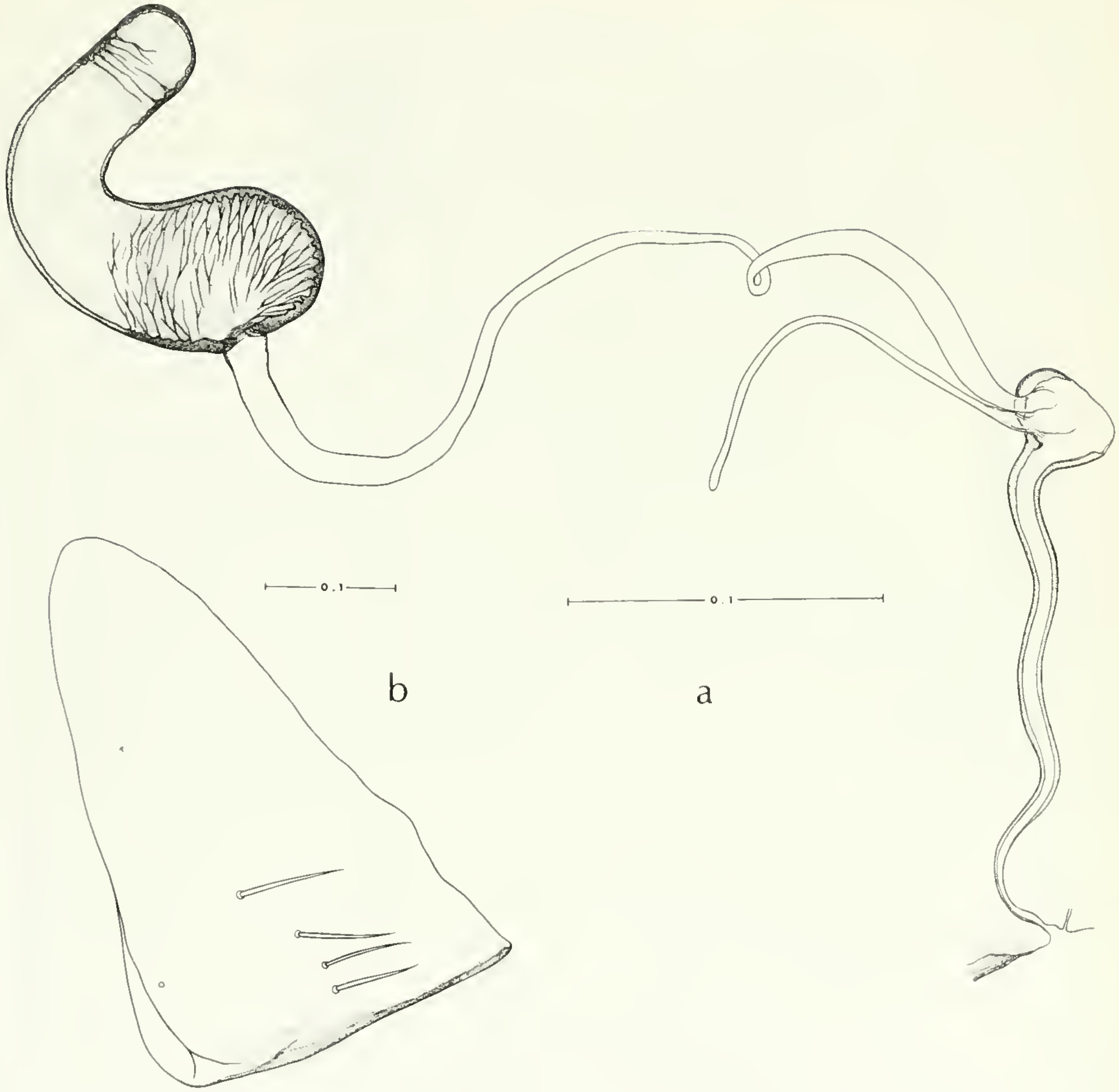


Fig. 82. *Rothschildopsylla noctilionis* (Costa Lima). Female: a, spermatheca, duct of spermatheca and bursa copulatrix. b. seventh sternum.

REMARKS

We have not compared our specimen with the male holotype but based on illustrations (Hopkins and Rothschild, 1956) it appears to be *R. noctilionis*. Since the female has not been collected heretofore, a brief description is given below.

DESCRIPTION

Female (Fig. 82). Seventh sternum with posterior margin straight except for slight undulations in ventral portion, row of 3 lateral setae with 1 larger seta above and cephalad of row. Spermatheca somewhat shape of boomerang; with no line of demarcation between bulga and hilla; bulga reticulate with some reticulation at apex of hilla; perula of bursa with long, thin, blind duct.

Genus *Sternopsylla* Jordan and Rothschild

Sternopsylla Jordan and Rothschild, 1921*b*:158.

Type Species: *Ischnopsylla texanus* I. Fox.

Sternopsylla distincta speciosa Johnson
(Fig. 83-86)

Sternopsylla distincta speciosa Johnson, 1957: 100, Pl. 48, Fig. 3, 4, Pl. 50, Fig. 3, 8.–Tipton and Mendez, 1966:307-308, Pl. 64, 65.

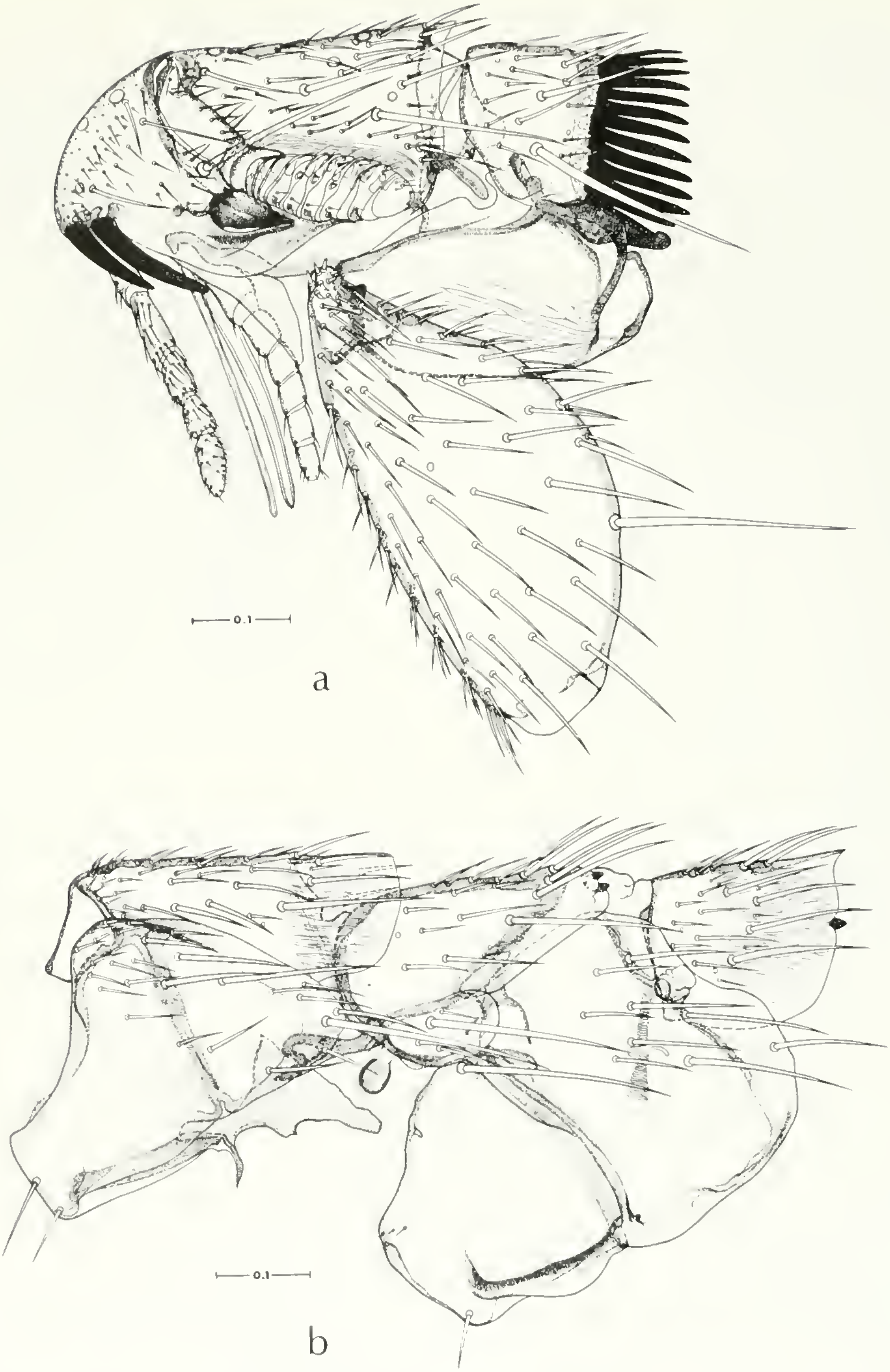


Fig. 83. *Sternopsylla distincta speciosa* Johnson. Male. a, head, prothorax and procoxa. b, meso- and metathorax and first abdominal segment.

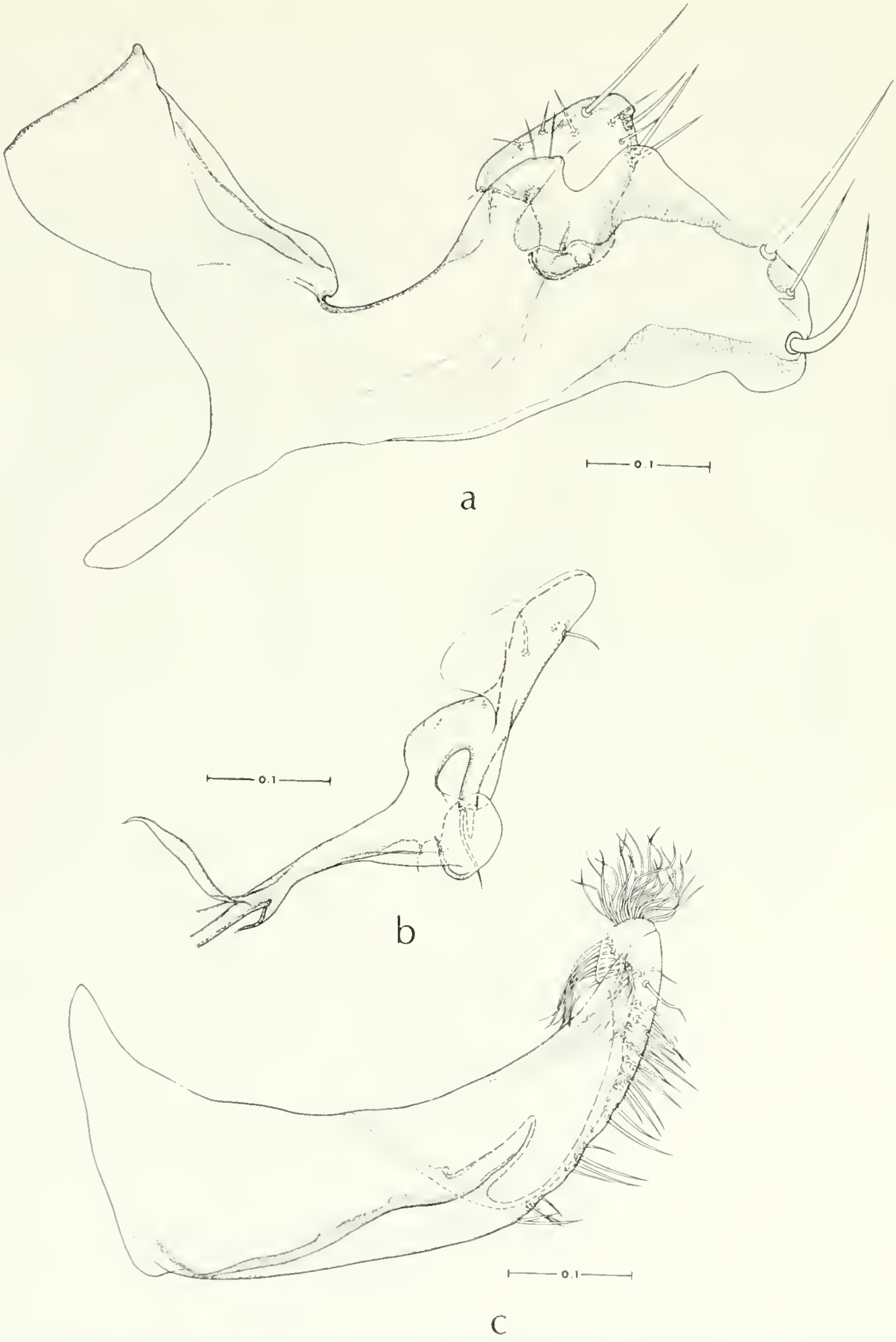


Fig. 84. *Sternopsylla distincta speciosa* Johnson. Male: a, process and movable finger of clasper. b ninth sternum. c, eighth sternum.

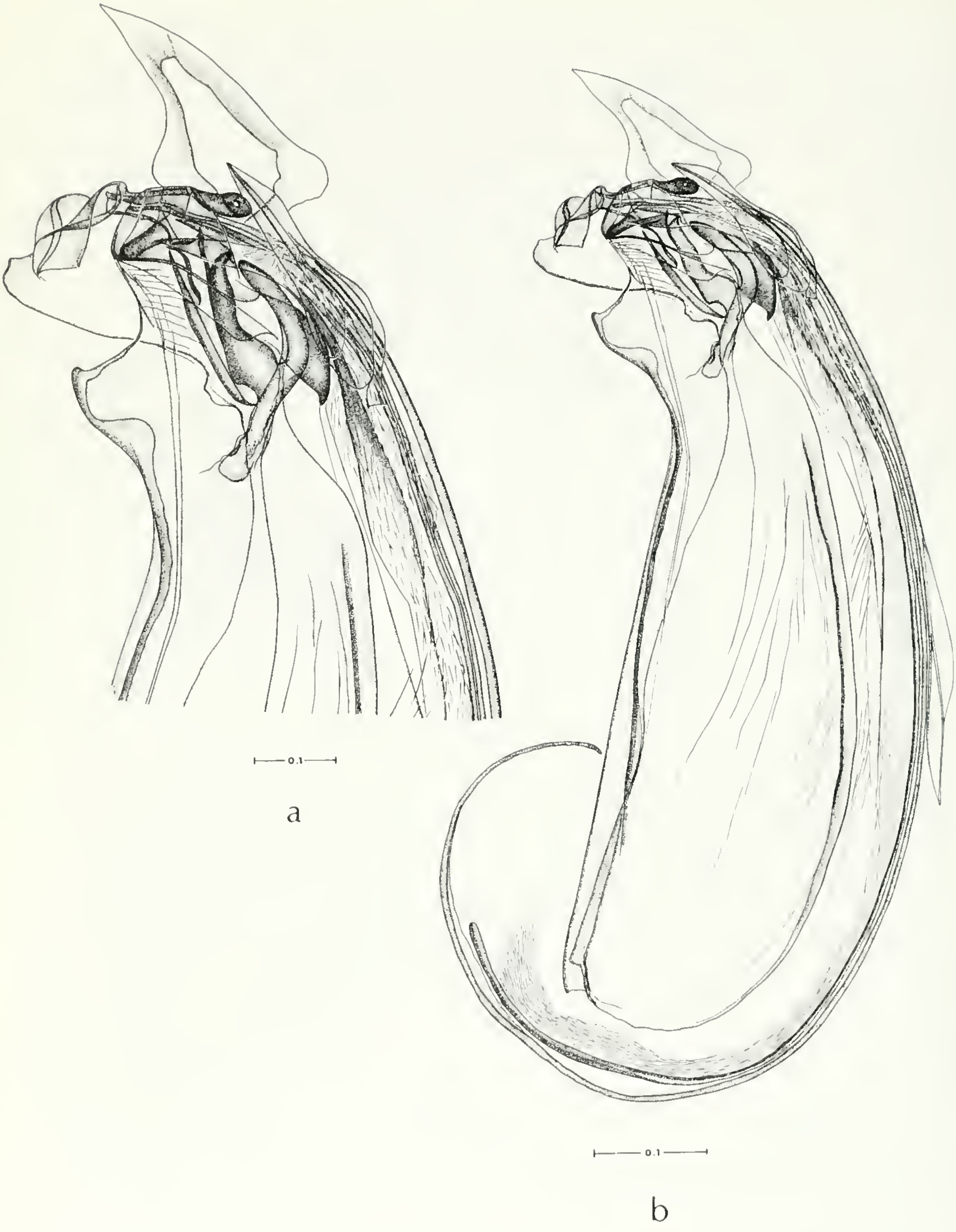


Fig. 85. *Sternopsylla distincta speciosa* Johnson. Male: a, apex of aedeagus, b, aedeagus.

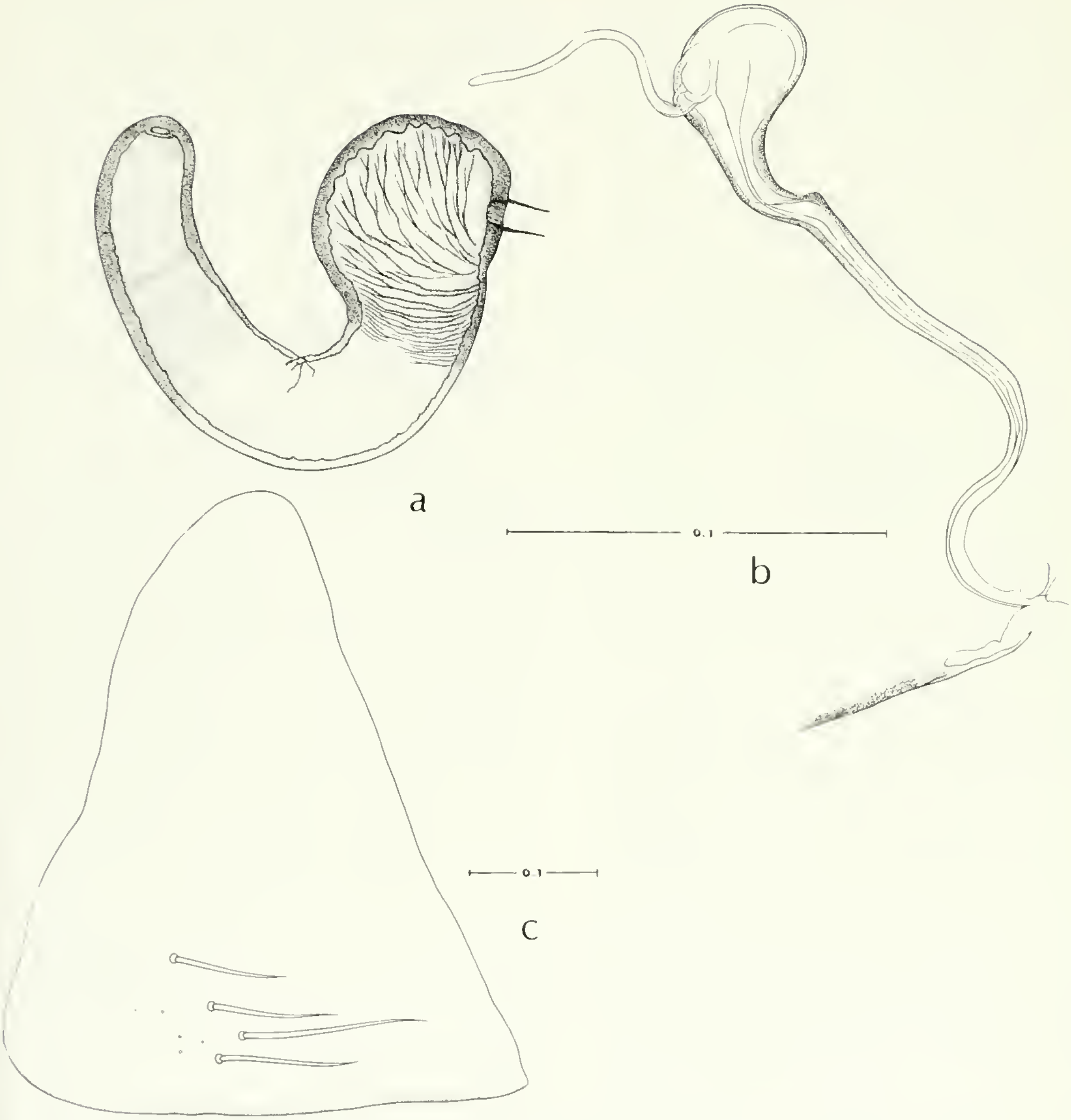


Fig. 86. *Sternopsylla distincta speciosa* Johnson. Female: a, spermatheca. b, bursa copulatrix. c, seventh sternum.

Type Data: Male holotype, female allotype, 3 paratype females ex *Tadarida brasiliensis*, Peru: Dept. of Cuzco, Quince Mil, 19-VI-1950, C. Kalinowski collector. One male and 3 female paratypes ex *Tadarida* species, Colombia: Dept of Huila, Pitalico, 1350 m elev., 28-XI-1951, P. Hershkovitz collector.

Other Recorded Distribution: Panama: ex *Myotis nigricans nigricans*, *M. chiloensis*, *Tadarida brasiliensis*, and *Tadarida yucatanica*.

VENEZUELAN RECORDS (1 male and 1 female)

One male (SVP 4017) ex *Tadarida brasiliensis*, La Mucuy, 4 mi. E Tabay, Mérida, 2107 m elev., 9-III-1966, Peterson team collector. One female (SVP 6912) ex *Tadarida gracilis*, 10 km NW Urama, Yaracuy, 25 m elev., 11-III-1966, Tuttle team collector.

REMARKS

The distal arm of the ninth sternum and apex of the aedeagus are similar to those illustrated by Tipton and Mendez (1966) for *S. d. speciosa*. Our male specimen from Venezuela differs from illustrations given by Tipton and

Mendez (1966) and Johnson (1957) in that the finger of the clasper is much broader apically. The eighth sternum is much wider in our specimen and the apical patch and the subapical row of pseudosetae are more pronounced. These differences in the eighth sternum may be due to the orientation of the specimen on the slide.

Family Ceratophyllidae

Genus *Dasypsyllus* Baker

Dasypsyllus Baker, 1905:129.

Type Species: *Ceratophyllus perpinnatus* Baker.

Dasypsyllus gallinulae perpinnatus (Baker)

Ceratophyllus perpinnatus Baker, 1904:386, 391, 445.

Dasypsyllus perpinnatus, Baker, 1905:129, 146.

Ceratophyllus gallinulae perpinnatus, Jordan, 1926:386.

Dasypsyllus gallinulae perpinnatus, Wagner, 1930:14.—Traub, 1950:104.—Tipton and Mendez, 1966:309, Pl. 67.

Type Data: Ex unknown host, Canada: Queen Charlotte Islands, J. K. Keen collector.

Other Recorded Distribution (South America): Argentina: ex nest of bird. Panama: ex *Sciurus granatensis chiriquensis*, *Zonotrichia capensis costaricensis*, and *Vireo leucophrys chiriquensis*. Venezuela: ex nest of *Xanthomus viridis*.

Venezuelan Records (23 males and 13 females)

Most of the specimens (16 males and 11 females) were collected from unidentified birds in the state of Mérida between 2150 and 2640 meters elevation. In addition, there were 2 males ex *Thomasomys lugens* and 1 male ex *Sciurus granatensis* from the state of Mérida. Two males were collected from 2 unidentified birds in the state of Táchira at about 2400 meters elevation. One female ex *Rhipidomys venustus* and 1 male ex *Atalapetes brunneinucha* were collected near Caracas at about 2000 meters elevation. One female ex *Atalapetes schistaceus* and 1 male ex an unidentified bird were collected in the state of Trujillo at 2360 meters elevation.

All of our specimens were collected at elevations above 2000 meters.

Dasypsyllus lasius venezuelensis (Fox and Anduze)

Ceratophyllus lasius Rothschild, 1909:63, Fig. 10.

Dasypsyllus lasius, Jordan, 1933:76.

Aresopsylla venezuelensis I. Fox and Anduze, 1917:108, Pl. 1, Fig. 1-3.

Dasypsyllus lasius venezuelensis, Johnson, 1957: 117, Pl. 53, 54, 55.—Barrera and Diaz-Ungria, 1957:179-180.—Machado-Allison, 1963: 276.—1966:26.—Tipton and Mendez, 1966:310, Pl. 68, 69.

Type Data: Male holotype, female allotype, male and female paratypes ex swallow's nest; Venezuela, Mérida, Apartaderos, 3300 m elev., IX-1944, collector P. Anduze.

Other Recorded Distribution: Panama, Chiriquí, ex *Notiochelidon cyanoleuca*.

Remarks

We did not collect *D. lasius venezuelensis* in Venezuela but had we obtained swallows' nests at high elevations it is likely that we would have encountered this species.

Dasypsyllus stejnegeri (Jordan)

Ceratophyllus stejnegeri Jordan, 1929:36-37, Pl. 2, Figs. 22, 23.—Costa Lima and Hathaway, 1946:319.

Dasypsyllus stejnegeri, Holland, 1949:12.—Smit, 1961:66, 67.—Tipton and Mendez, 1968:191.

Type Data: Male lectotype (Smit, 1961) ex unknown host, Bering Island, Northern Pacific Ocean, 1882-1883.

Other Recorded Distribution: East Falkland: Stanley, ex *Turdus falklandii falklandii*, *Pezmites militaris falklandicus*, and *Passer domesticus*. Alaska: Homer, ex *Marmosa caligata*. Mexico: Cerro Potosi, (collected above 3200 meters) ex bird nest, man.

Venezuelan Records (3 females)

One female (SVP 3950) ex *Didelphis azarae*, Timotes, Mérida, 3275 m elev., 9-II-66. One female (SVP 4260) ex "bird," La Coromoto, Mérida, 3170 m elev., 19-III-66. One female (SVP 4296) ex *Zonotrichia capensis*, La Coromoto, Mérida, 3170 m elev. 21-III-66.

Remarks

D. Stejnegeri has been collected so rarely that it is difficult to comment about its distribution. We suspect that it is a common bird flea in Venezuela at high elevations. Our 3 specimens were collected above 3100 meters.

Genus *Orchopeas* Jordan

Orchopeas Jordan, 1933:71.

Type Species: *Pulex wickhami* Baker

Orchopeas howardi (Baker)

Pulex wickhami Baker, 1895:109, 111.

Pulex howardi Baker, 1895:110, 112.

Orchopeas wickhami, Jordan, 1933:71-72.

Orchopeas howardi, Ewing and Fox, 1943:33.—Costa Lima and Hathaway, 1946:259-260.—Traub, 1950:100, 101.—Eads, 1950:46-48, Fig. 1-10.—Barrera, 1955:90-93, Fig. 5-12.

Type Data: Type specimens ex red squirrel (=*Tamiasciurus hudsonicus?*), Ithaca, New York; ex squirrel, Tullula Falls, Georgia; ex gray or fox squirrel and field mouse nest, Lincoln, Nebraska; ex unknown host, Ames, Iowa.

Other Recorded Distribution: Eastern United States and Canada. It has been collected in several localities in the western United States where it may have been introduced with tree squirrels from the eastern states. Subspecies have been described from Texas and Mexico.

Venezuelan Records (2 males)

Two males ex *Sciurus granatensis* (SVP 22010), Táchira, Buena Vista, 2350 meters elevation.

Remarks

Our specimens are definitely not *O. howardi howardi* (Baker), *O. howardi texensis* Eads or *O. howardi bolivari* Barrera but probably represent an undescribed subspecies. We prefer not to describe this material until additional specimens are available. This is the first collection of a representative of the genus *Orchopeas* in South America.

Genus *Pleochaetis* Jordan

Pleochaetis Jordan, 1933:77-79.

Type Species: *Ceratophyllus mundus* Jordan and Rothschild.

Pleochaetis apollinaris (Jordan and Rothschild)
(Fig. 87, 91c)

Ceratophyllus apollinaris Jordan and Rothschild, 1921*c*:176, Fig. 163, 164.—Traub, 1950:36-37, Pl. 20, Fig. 8-13.—Johnson, 1954:289, 291, Fig. 5.—1957:120.

Type Data: Description based on 2 females ex *Mustela affinis* (=*M. frenata affinis*); Colombia: savannah of Bogota; Coll. Apollinaire-Marie; V-1917.

Other Recorded Distribution: Colombia, Río Balcones, Guasco, Dept. of Cundinamarca, 1 male and 3 females ex *Mustela frenata*.

Venezuelan Records (3 males and 7 females)

All 10 specimens were collected in Táchira, 2 females ex *Thomasomys hylophilus* and 3 males and 5 females ex *Akodon bogotensis*.

Remarks

Since the description of *P. apollinaris* was based on 2 female specimens and there has been only one subsequent collection of one male, it is difficult to adequately define this species. Our specimens conform to the description and illustrations given by Johnson (1954) in that the ventral-most of the four large bristles on the movable process of the clasper is inserted above the notch on the anterior margin of the movable process; the crochet is curved and fingerlike and there are two strong setae on the proximal lobe of the distal arm of the ninth sternum. Our specimens differ in that there is only one ventral bristle on the eighth tergum and in details of the aedeagus.

Pleochaetis dolens (Jordan and Rothschild)
(Fig. 88)

Ceratophyllus dolens Jordan and Rothschild, 1914:257, Fig. 1, 2.

Pleochaetis dolens, Jordan, 1933:77.

Type Data: Costa Rica ex *Sciurus hoffmanni* (=*S. granatensis hoffmanni*).

Venezuelan Records (5 males and 14 females)

There were 3 males and 6 females ex 6 *Rhipidomys venustus* (Dto. Federal); 1 male and 2 females ex 1 *Rhipidomys venezuelae* (Dto. Federal); 1 male and 5 females ex 2 *Sciurus granatensis* (Dto. Federal and Mérida); 1 female ex *Rattus norvegicus* (Dto. Federal).

Remarks

Our specimens are undoubtedly *Pleochaetis dolens* but differ somewhat from the nominate subspecies. There are 3 strong setae on the proximal lobe of the distal arm of the ninth sternum rather than 2; the setae on the male eighth sternum are stronger and more numerous and the crochet is more broadly truncate than indicated by Traub (1950) and Tipton and Mendez (1966) for *P. dolens dolens*. There are additional differences in details of the aedeagus.

Pleochaetis dolens quitanus (Jordan)
(Fig. 89)

Ceratophyllus dolens quitanus Jordan, 1931: 136*b*, Fig. 2-4.

Trichopsylla (*Pleochaetis*) *dolens quitanus*, Costa Lima and Hathaway, 1946:306.—Machiavello, 1948:29.

Pleochaetis dolens quitanus, Jordan, 1950:605.—Traub, 1950:36, Pl. 20, Fig. 1-3.—Johnson, 1954:295.—1957:120-121, Pl. 57, Fig. 2, 4, 6.

Type Data: Male holotype plus 1 female ex *Oryzomys* sp. Ecuador, Cerro de Puntas,

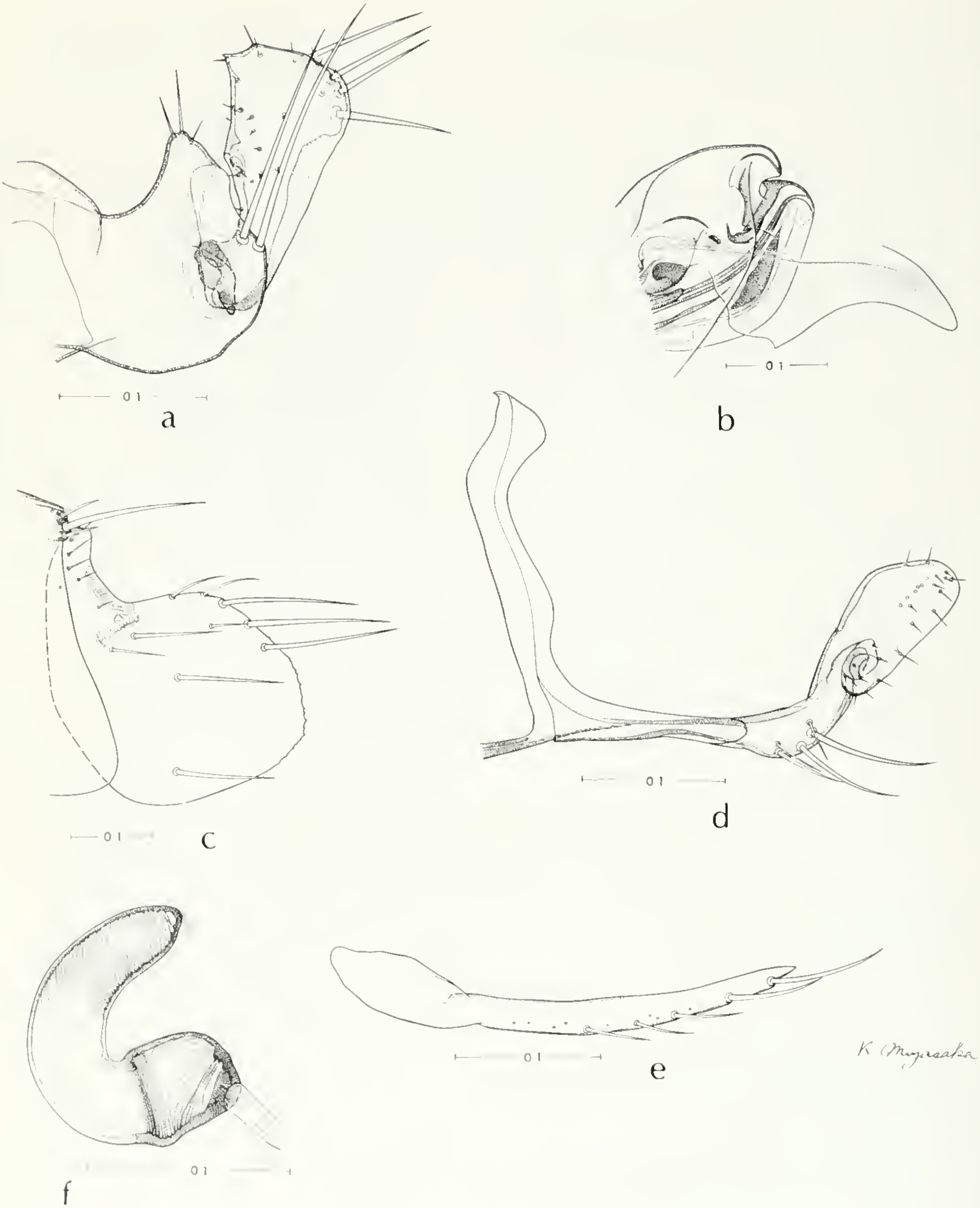

0.1
a
0.1
b
0.1
c
0.1
d
0.1
e
0.1
f
K Miyasaka

Fig. 87. *Pleochaetis apollinaris* (Jordan and Rothschild). Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.

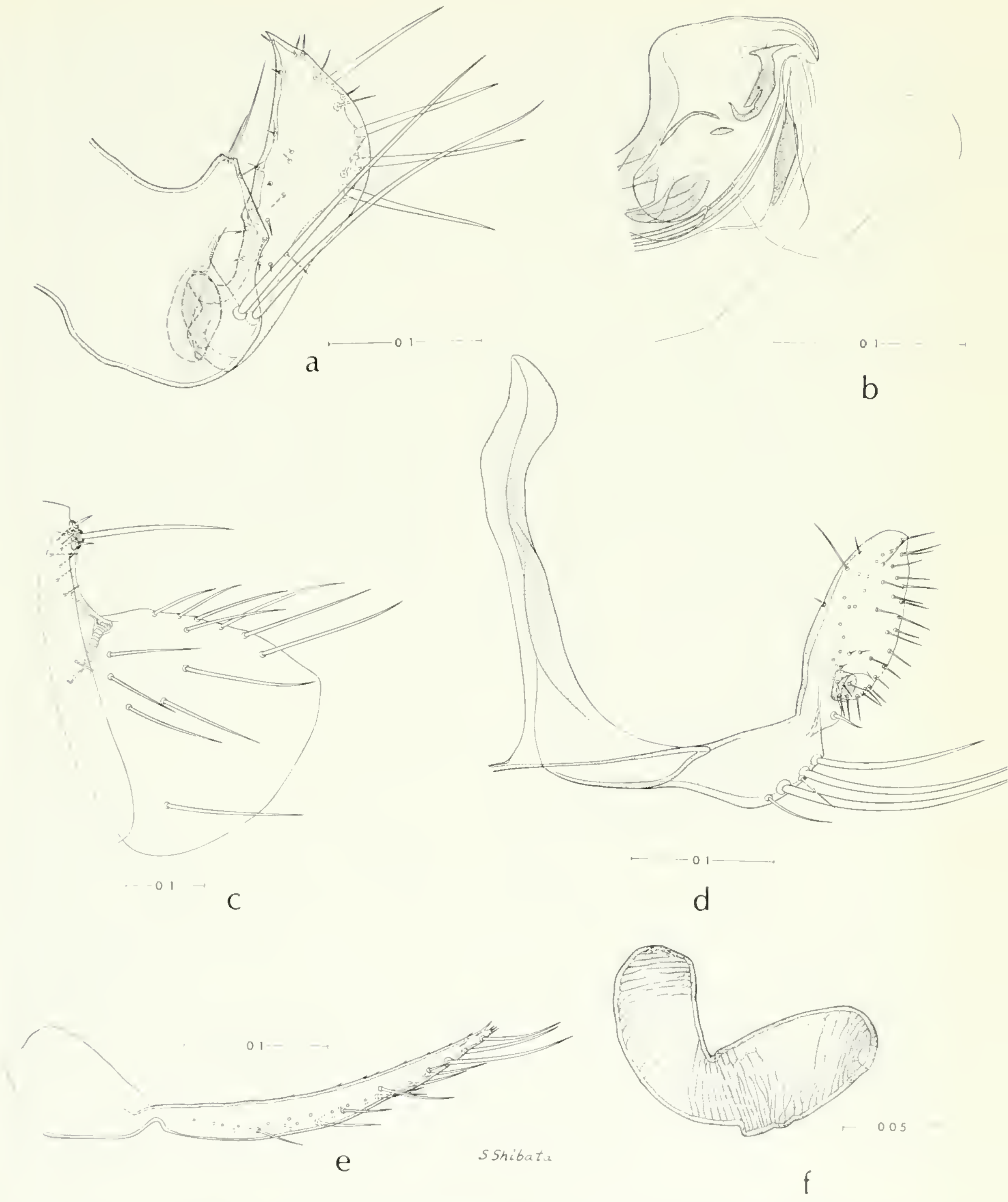

0.1
a
0.1
b
0.1
c
0.1
d
0.1
e
S Shibata
0.05
f

Fig. 88. *Pleochaetis dolens* (Jordan) ex *Rhipidomys venustus* (SVP 0780), Dto Federal. a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.

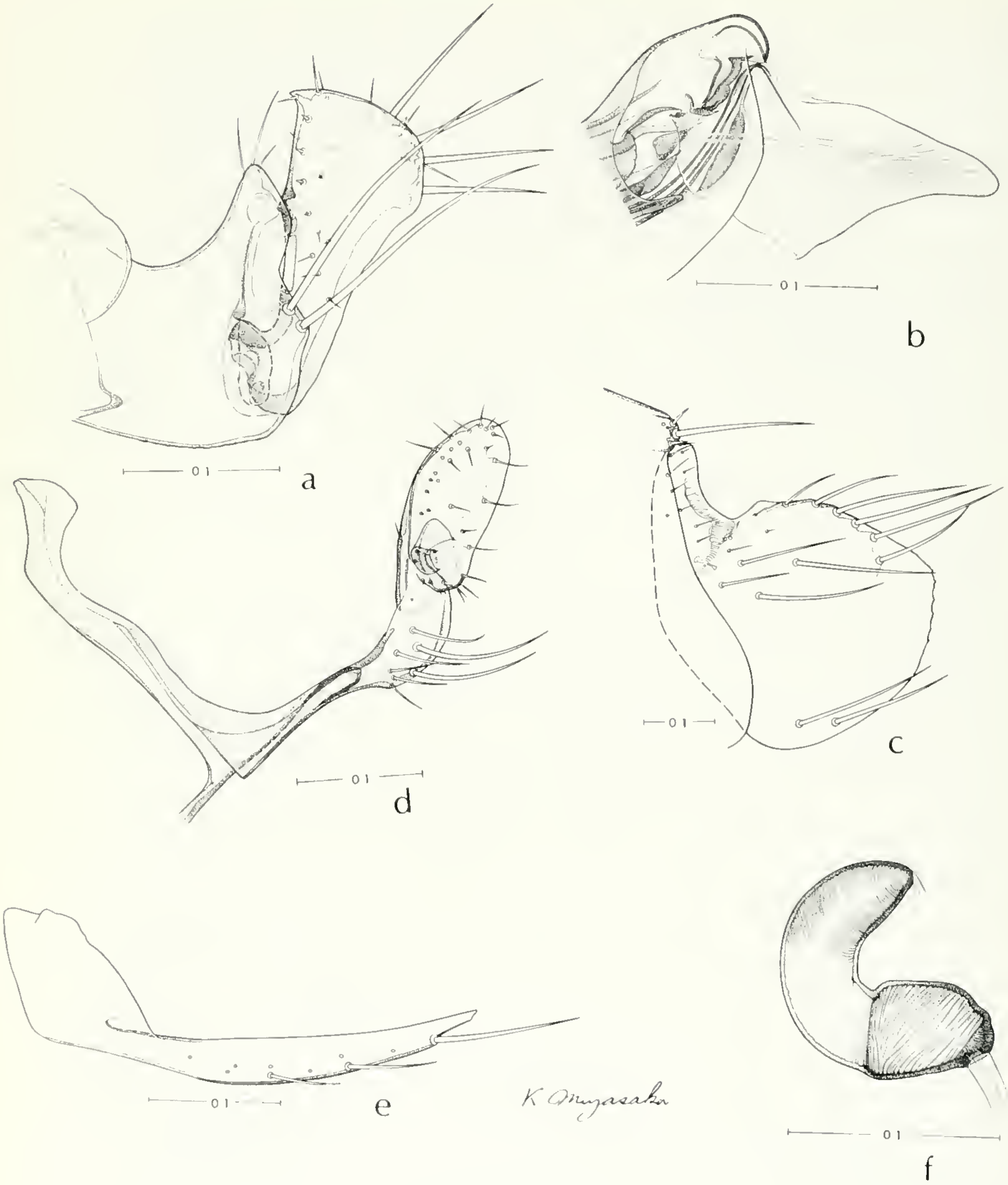


Fig. 89. *Pleochaetis dolens quitanus* (Jordan) ex *Rhipidomys venustus* (SVP 4264), Merida, La Coromoto. Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.

Coll. F. Spillman. Two females as above except *Thomasomys* sp. One male ex *Thomasomys* sp. but Chimborazo. One male ex unknown host near Quito.

Other Recorded Distribution: Peru: ex nests of *Akodon mollis orophilus* and ex *Oligoryzomys longicaudatus stolzmanni* (=*Oryzomys longicaudatus stolzmanni*), *Akodon mollis*, "nest in field" and human bed.

VENEZUELAN RECORDS (122 males and 150 females). See Table 7.

REMARKS

In our series the females have no sinus in the caudal margin of the seventh sternum and the tail of the spermatheca near the bulga has no striations. The fourth bristle of the movable process of the clasper of the male is well above the level of the anterior notch. These characters are in agreement with those given by Johnson (1957) for *P. dolens quitanus*. However, several characters are not in agreement with her illustrations: the caudal margin of the movable process of the clasper is concave, not straight; the dorsocaudal margin of the immovable process of the clasper is sharply angular rather than slightly angular; the setae on the proximal lobe of the distal arm of the ninth sternum are in an irregular patch not in a marginal row. Assignment of our specimens to *P. dolens quitanus* is provisional. Further study is required to determine the degree of variation and to establish the relationship between *P. dolens quitanus* and *P. equatoris*.

All specimens were collected near Mérida between 3,048 and 3,658 meters elevation. Nearly 41% of the specimens were collected from *Oryzomys minutus*. Most of the specimens of *P. smiti* were collected from this host at the same elevation and in the same collecting area.

Pleochaetis smiti Johnson
(Fig. 90, 91g)

Pleochaetis smiti Johnson, 1954:291-295. Fig. 1, 3, 6, 7, 8, 10, 12, 13, 16, 21, 23, 25, 26, 31.—1957:121.

Type Data: Male holotype ex *Thomasomys laniger*; Colombia: Dept. of Antioquia, Paramo. Coll. P. Hershkovitz, 13-X-1950. Female allotype same data except 12-X-1950. Female paratype ex *Oryzomys* sp. Ecuador, Region Oriental, Paramo de Guamaní, 27-VII-1931, Coll. F. Spillmann.

Other Recorded Distribution: None.

VENEZUELAN RECORDS (203 males and 208 females). See Table 8.

REMARKS

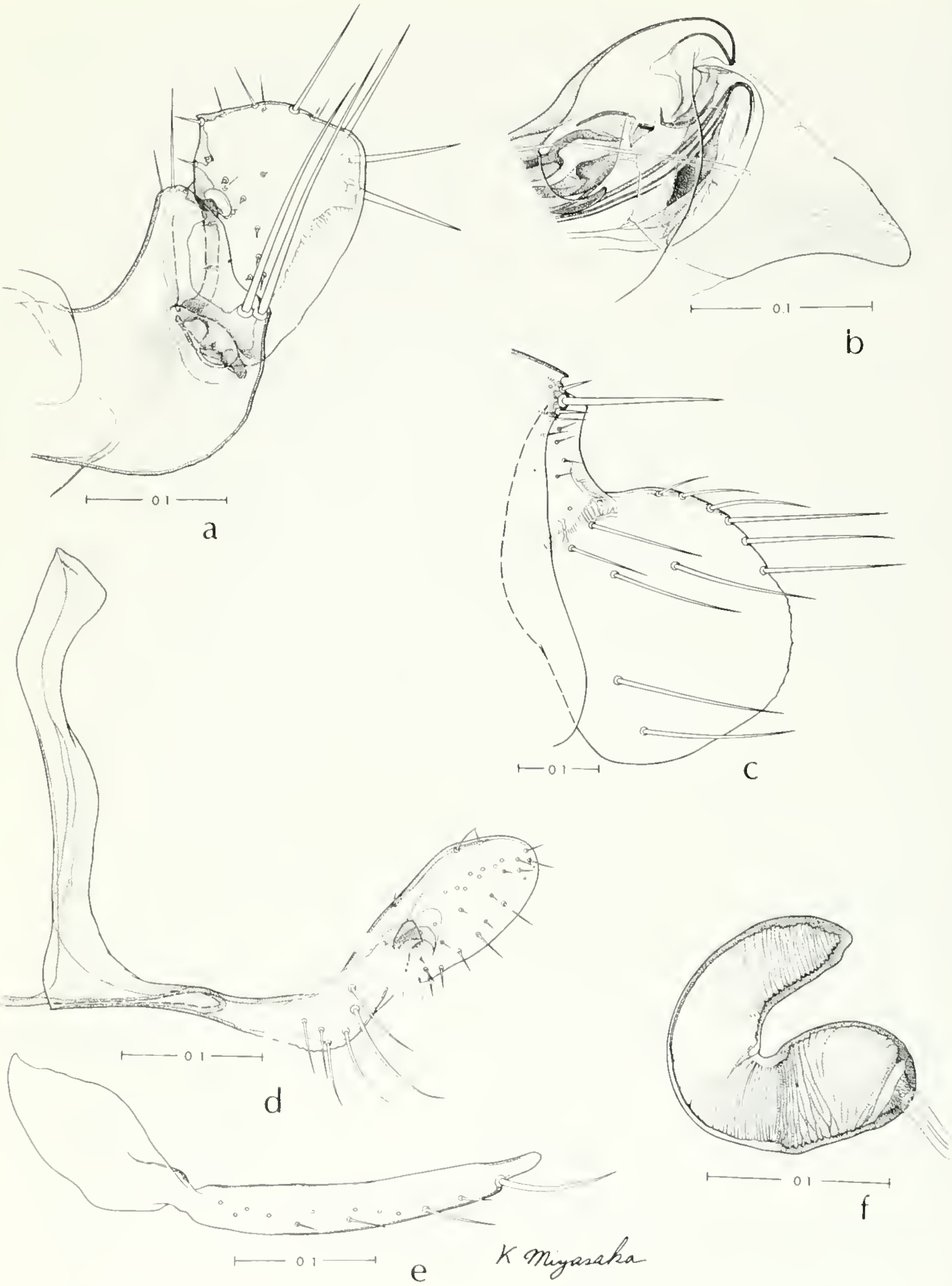
The description of *Pleochaetis smiti* Johnson (1954) was based on 1 male and 2 females from Colombia. Our collections are from three areas in Venezuela (180 males and 197 females from Mérida, 16 males and 8 females from Táchira, and 8 males and 3 females from Trujillo). Specimens from Táchira fit rather well the description and illustrations given by Johnson. In all of the female specimens from Venezuela the caudal margin of the seventh sternum is remarkably like illustrations given by Johnson. However, the juncture of the head and tail of the spermatheca is more pronounced in many of the Veneznelan specimens. In the Venezuelan specimens there are 24 teeth in the pronotal comb (23-26 in type specimens), 5 or 6 dorsal notches on the metatibia (7 in type specimens), no long setae on the proximal lobe of the distal arm of the ninth sternum (DA9) (none in type specimens), the distal lobe of DA9 is swollen (sides parallel in type specimens), the apex of the sclerotized inner tube is rounded (sharply pointed in type specimens) and the caudoventral margin of the crochet is deeply concave (slightly concave in type specimens). The caudal margin of the movable pro-

Table 7. Venezuelan Records of *Pleochaetis dolens quitanus* (Jordan).

Host	Number of host specimens	Fleas		Index
		Males	Females	
Oryzomys minutus	84	64	76	1.66
Thomasomys laniger	36	36	54	2.50
Akodon bogotensis	11	12	9	1.91
Cryptotis thomasi	3	6	7	4.33
Found in camp	0	1	1	
Didelphis azarae	1	0	1	
Rhipidomys sp.	1	3	1	

Table 8. Venezuelan Records of *Pleochaetis smiti* Johnson.

Host	Number of host specimens	Fleas		Index
		Males	Females	
Mérida: 1980-3785 meters elev.				
Oryzomys minutus	138	162	173	2.42
Thomasomys laniger	21	13	20	1.52
Didelphis azarae	1	2	2	
Cryptotis thomasi	1	1	1	
Rhipidomys venustus	1	1	0	
Bird	1	1	0	
Found in camp	0	0	1	
Trujillo: 2225-2360 meters elev.				
Oryzomys minutus	9	8	3	1.11
Táchira: 2288-2418 meters elev.				
Oryzomys minutus	11	12	6	1.63
Thomasomys hylophilus	6	4	2	1.00



K Miyasaka

Fig. 90. *Pleochaetis smiti* Johnson ex *Oryzomys minutus* (SVP 04067), Merida La Coromoto. Male: a, process and movable finger of clasper. b, apex of aedeagus. c, seventh and eighth abdominal terga. d, ninth sternum. e, eighth sternum. Female: f, spermatheca.

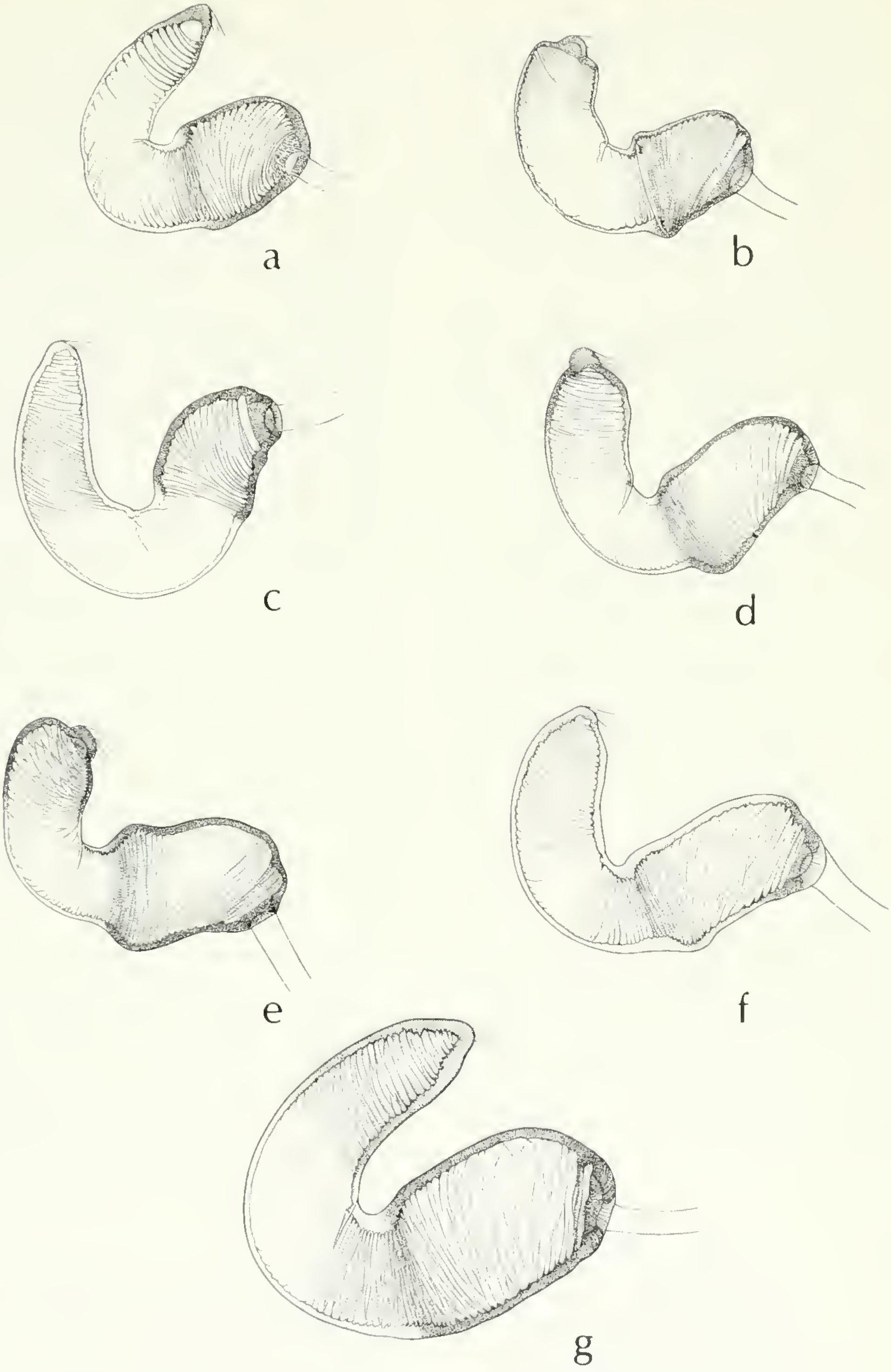


Fig. 91. Spermathecae of *Pleochaetis* species: a, *P. asetus* (ex *Microtus mexicanus subsimus*, Cerro Potosi, Mexico). b, *P. aztecus* (ex *Peromyscus melanotis*, Cerro Potosi, Mexico). c, *P. appolinaris* (ex *Akodon bogotensis*, SVP 21901, Venezuela). d, *P. dolens* (ex *Sciurus granatensis chiriquensis*, Panama). e, *P. mathesoni* (ex *Reithrodontomys c. chrysopsis*, Mexico). f, *P. sibynus* (ex *Peromyscus difficilis*, Cerro Potosi, Mexico). g, *P. smiti* (ex *Oryzomys minutus*, SVP 4067, Venezuela).

cess of the clasper is deeply concave in the type specimens and also in the Táchira specimens but in the Trujillo and Mérida specimens the caudal margin is straight.

Each of the three populations from Venezuela may represent a subspecies of *P. smiti*. However, until more specimens are collected from the type locality to determine the degree of variation we prefer to call all of our specimens *P. smiti*.

Approximately 85% of the specimens from Mérida were collected from *Oryzomys minutus*. Essentially all of the specimens were collected above 2286 meters elevation and 96.4% were collected above 3,048 meters elevation.

Notes on the genus *Pleochaetis*

The genus *Pleochaetis* is a large and complex genus. The need for a revision is apparent. Johnson (1954) commented on the confusion surrounding the relationship between *P. equatoris equatoris* and *P. apollinaris* and there are similar problems related to other species groups. A thorough study of long series from type localities will be required to resolve these problems. Figure 91 shows spermathecae of seven species of *Pleochaetis* collected from four widely separated geographic areas. Each spermatheca is distinctive but collections in intermediate areas reveal intergradations.

P. smiti and *P. dolens quitanus* parasitize the same host (*Oryzomys minutus*) at the same elevation (3048 to 3810 meters). It would be illuminating to ascertain experimentally the rigidity of the reproductive isolating mechanisms between these two species and the extent that one species may exert an influence on the gene pool of the other. Extreme variation in the Mérida populations of *P. smiti* may be due to competitive pressure or introgression.

Family Leptopsyllidae

Genus *Leptopsylla* Jordan and Rothschild

Leptopsylla Jordan and Rothschild, 1911:85.

Type Species: *Pulex musculi* Duges, 1832 (=*Pulex segnis* Schönherr, 1811).

Leptopsylla segnis (Schönherr)

Pulex segnis Schönherr, 1811:98.

Leptopsylla musculi, Jordan and Rothschild, 1911:85.

Leptopsylla segnis, Dalla Torre, 1924:2.—Ewing and Fox, 1943:93, Fig. 8G.—Anduze, Vogelsang, and Pifano, 1947:4. — Macchiavello, 1948:24-26. — Traub, 1950:105, Pl. 51, Fig. 1.—Johnson, 1957:113, 114, Pl. 51, 52.—Barrera and Diaz-Ungria, 1957:164, 175-176.—Cova Garcia and Tallaferro, 1959: 328, 331, 336.—Machado-Allison, 1966:22, 24, 28.

Type Data: Ex *Mus musculus*, Sweden.

Other Recorded Distribution: Argentina, Brazil, Chile, Ecuador, Peru: ex species of the following genera: *Akodon*, *Mus*, *Rattus*, and *Cavia*.

Venezuelan Records (25 males and 31 females)

There were 15 males and 26 females ex 20 *Mus musculus* (from Dto. Federal, Trujillo, and Mérida). In addition there were: 8 males and 4 females ex 4 *Rattus norvegicus* (Dto. Federal and Mérida), 2 males and 2 females ex 2 *Oryzomys albigularis* (Dto. Federal), and 2 *Oryzomys minutus* (Mérida).

Remarks

More than 71% of our specimens were collected from *Mus musculus* and approximately 93% from *Mus musculus* plus *Rattus rattus*. All of our specimens were collected at elevations above 1770 meters and 60% of the specimens came from elevations in excess of 2743 meters. We suspect that *L. segnis* has become an established component of the South American fauna, particularly at high elevations.

LITERATURE CITED

Anduze, P., and E. Vogelsang. 1949. *Pulex irritans* L. 1758 y *Ctenocephalides felis* (Bouché) 1835, parásitos del zorro (*Cerdocyon thous thous*). Revista de Medicina Veterinaria y Parasitologia. Caracas 8:1-4.

Anduze, P. J., E. G. Vogelsang, and C. F. Pifano. 1947. Nómina de los artrópodos vulnerantes actualmente conocidos en Venezuela. Boletin de Entomologia Venezolana 6:1-16.

Baker, C. F. 1895. Preliminary studies in Siphonaptera 1-7. Canadian Entomologist 27:19-22, 63-67, 108-112, 130-132, 162-164, 186-191, 221.

———. 1904. A revision of American Siphonaptera. or fleas, together with a complete list and bibliography of the group. Proceedings of the United States National Museum 27(1361):365-469, plates 10-26.

———. 1905. The classification of the American Siphonaptera. Proceedings of the United States National Museum 29(1417):121-170.

Barrera, A. 1952. Notas sobre sifonápteros. V. Consideraciones sobre los géneros que formal la subfamilia Rhopalopsyllinae Oudemans, 1909 (Ins., Siph. Rhopalops.). Ciencia (México) 12(7-8):187-194 Fig. 1-6.

———. 1954. Notas sobre sifonápteros. VIII. Nuevas

localidades de especies conocidas y nuevas para México y diagnosis de *Pleochaetis apollinaris aztecus* subsp. nov. Ciencia (México) 14(7-8):137-139, Fig. 1-3.

———. 1955. Notas sobre sifonápteros. I. Algunas especies mexicanas; consideraciones sobre su distribución geográfica. Revista de la Sociedad Mexicana de Entomologia 1(1-2):85-98, Fig 1-19

Barrera, A., and C. Diaz-Ungria. 1957. Sifonápteros de Venezuela. Consideraciones generales, catálogo anotado y claves, con exposición gráfica de los carácteres en ellas utilizados (Insecta; Siphonaptera). Memoria de la Sociedad de Ciencias Naturales La Salle 17:160-189, láminas 1-4.

Bouche, P. F. 1835. Beiträge zur Insektenkunde II. Bemerkungen uber die Gattung *Pulex*. Nova Acta Physico-medica Academiae Caesareae-Leopoldinisch-Carolinische 17(1):493-508, Fig. 1-5.

Costa Lima, A da 1920. A new species of bat flea from Matto Grosso *Ischnopsyllus noctilionis*. Revista de Sciencias. Rio de Janeiro 4:56-57, Fig. 1-2

———. 1938. Uma nova pulga do Mexico e nota sobre *Hormopsylla* (Siphonaptera, Ischnopsyllidae). Revista Médico-Cirúrgica do Brasil 46(2:2):181-187.

Costa Lima, A. da, and C. R. Hathaway. 1946. Pulgas: Bibliografia. catálogo e hospedadores. Monografias do Instituto Oswaldo Cruz No. 4. December 1946, pages 1-522.

Cova García, P. and E. Tallaferro. 1959. Pulgas más comunes de Venezuela. Archivos Venezolanos de Patologia Tropical y Parasitologia Médica 3:327-348, Fig. 1-5.

Curtis, J 1824-1840. British Entomology. 16 vols.

Dalla Torre, C. G. 1924. Aphaniptera orbis-terrarum (Synopsis praecursoria). Bericht des Naturwissen-schaftlich-Medizinischer Verenis in Innsbruck 39:1-29.

Del Ponte, E. 1967. Notas sobre suctoria argentinas. VI. Clave para las especies de *Polygenis* Jordan, 1939 (Malacopsylloidea, Rhopalopsyllidae); diagnosis de 5 sp. nov. y otras notas. Segundas Jornadas Entomoepidemiológicas Argentinas, II (1965):55-70 Fig. 1-23.

Diaz Issac, R. 1948. Aspectos epidemiológicos do la peste en Venezuela. Archivos Venezolanos de Patologia Tropical y Parasitología Médica 1:93-110.

Dugès, A. L. 1832. Recherches sur les caractères zoologiques de genre *Pulex* et sur la multiplicité des espèces qu'il enferme. Annales des Sciences Naturelles 27:145-164.

Eads, R. B. 1950. A new *Orchopeas* Jordan (Siphonaptera) from the fox squirrel, *Sciurus niger* Linnaeus. Annals Entomological Society of America 43:46-48.

Ewing, H E. 1925. Notes on the siphonapteran genus *Doratopsylla* Jordan and Rothschild, together with a description of a new genus and species of fleas. Journal of Parasitology 12:43-46.

Ewing, H. E., and Fox, I. 1943. The fleas of North America. United States Department of Agriculture Miscellaneous Publication 500:1-142 Fig. 1-13.

Fox, I. 1940. Fleas of Eastern United States. Iowa State College Press. pages 1-191, plates 1-31.

———. 1947. Notes on ectoparasites from Venezuela (Siphonaptera and Acarina). Zoológica, Scientific Contributions of the New York Zoological Society 32(3):117-119. Fig. 1 2.

Fox I., and P. J. Anduze. 1947. A new bird flea from Venezeula (*Aresopsylla venezuelensis*, new genus and species). Boletin de Entomologia Venezolana 6(2-4):107-110, Fig. 1 3.

Frauenfield, G. B. 1860. *Hectopsylla psittaci* n. g., n. sp. Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematisch-naturwissenschaftliche Klasse 40:462-465.

Glinkiewicz, A. 1907. Parasiten von *Pachuromys duprasi* Lataste. Wein, Sitzungsberichte der Kaiserlichen Akademie der Wissenchaften, Mathematisch-Naturwissenschaftliche Klasse 116(3):381-386, Fig. 1-2

Guimarães, L. R. 1940. Notas sôbre Siphonaptera e redescrição de *Polygenis occidentalis* (Almeida Cunha, 1914). Arquivos de Zoologia do Estado de São Paulo 2(6):215-250, Fig. 1-5. 1 plate.

———. 1942. Sôbre algumas espécies de pulgas Brasileiras. Papéis Alvusos do Departamento de Zoologia 2(15):197-203, Fig. 1-3.

———. 1945. Alguns aspectos bionômicos de *Leptopsylla segnis* (Schonh). (Suctoria) Arquivos de Zoologia do Estado de São Paulo 4(7):233-260.

———. 1947. Duas novas espécies de *Polygenis* Jordan, 1939 (Pulicidae-Suctoria). Papéis Avulsos do Departmento de Zoologia 8(15):189-195, Fig. 1 2

———. 1948. Sôbre algumas espécies do gênero *Polygenis* Jordan, 1939 (Pulicidae-Suctoria). Arquivos de Zoologia do Estado de São Paulo 5(3): 539-552, Fig. 1-7.

———. 1953. Um novo gênero de pulga da família Ischnopsyllidae (Siphonaptera). Papéis Alvulsos do Departamento de Zoologia 11(12):109-110.

———. 1954. Notas sôbre algumas espécies de Hystrichopsyllidae (Siphonaptera) da América do Sul. Papéis Avulsos do Departmento de Zoologia 11(26):509-515

———. 1956. Nova espécie de pulga do gênero *Polygenis* Jordan, 1939 (Rhopalopsyllidae). Revista Brasileira de Malariologia 8(1):171-174, Fig. 1-5.

Haller, G. 1880. *Rhynchopsyllus*, eine neue pulicidengattung, in einigen worten gekennzeichnet Archiv fur Naturgeschichte 46(1):72-87. Fig. 1-13.

Hecht, O. 1942. Las pulgas de las ratas en Venezuela (Nota preliminar). Revista de Sanidad y Asistensia Social 7(6):811-820, Fig. 1-2.

———. 1943. Consideraciones entomologicas a la epidemiologia de la pesta bubonica de los roedores en Venezuela. Revista de Sanidad y Asistencia Social 7:811-820.

Holland, G. P. 1949. The Siphonaptera of Canada. Dominion of Canada, Department of Agriculture Publication 817, Technical Bulletin 70: 1-306, plates 1-42.

———. 1951. Notes on some bird fleas, with the description of a new species of *Ceratophyllus*, and a key to the bird fleas known from Canada (Siphonaptera; Ceratophyllidae). The Canadian Entomologist 83(11):281-289, Fig. 1-10.

Hopkins, G. H E. 1951. Notes on fleas. Annals and Magazine of Natural History Series 12, 4:529-544, Fig. 1-5.

———. 1952. Notes on synonymy in Siphonaptera. Journal of the Washington Academy of Sciences 42(11):363-365.

Hopkins, G. H. E. and M. Rothschild. 1953. An illustrated catalogue of the Rothschild collection of fleas (Siphonaptera) in the British Museum (Natural History) Volume I, Tungidae and Pulicidae British Museum (Natural History) pages i-xv and 1-361, Fig. 1-465.

———. 1956. An illustrated catalogue of the Rothschild collection of fleas (Siphonaptera) in the British Museum (Natural History). Volume II Coptopsyllidae, Vermipsyllidae, Stephanocircidae, Xiphipsyllidae. British Museum (Natural History) pages i-xi and 1-445, Fig. 1-708, plates 1-32.

———. 1962. An illustrated catalogue of the Rothschild collection of fleas (Siphonaptera) in the British Museum (Natural History). Volume III, Hystrichopsyllidae (Acedestiinae, Anomiopsyllinae Hystrichopsyllinae, Neopsyllinae, Rhadinopsyllinae and Stenoponiinae). British Museum (Natural History) pages i-viii and 1-560, Fig. 1-1050 plates 1-10.

———. 1966. An illustrated catalogue of the Rothschild collection of fleas (Siphonaptera) in the British Museum (Natural History). Volume IV, Hystrichopsyllidae (Ctenophthalminae, Dinopsyllinae, Doratopsyllinae and Listropsyllinae). British Museum (Natural History) pages 1-549, Fig. 1-926. plates 1-12.

Hubbard, C. A. 1947. Fleas of Western North America. Iowa State College Press, pages 1-533, Fig. 1-4, plates 1-95.

Jarocki, F. P. 1838. Zoologiia czyli zweirzepotismo Ogolne podlug Naynowszego Systematu. Zoology, or general descriptions of animals in accordance with the latest system. 6:50-52. Warsaw. (Translation of portion on ectoparasites published by Rothschild, 1921, in Ectoparasites, 1:129.)

Johnson, P. T. 1954. Notes on *Pleochaetis* Jordan, 1933 from Colombia, with the description of a new species (Siphonaptera: Ceratophyllidae). Journal of the Washington Academy of Sciences 44(9): 289-296, Fig. 1-31.

———. 1957. A classification of Siphonaptera of South America. Memoirs of the Entomological Society of Washington Number 5:1-298, plates 1-114.

Jordan, K. 1926. New Siphonaptera. Novitates Zoologicae 33:385-394. Fig. 1-22.

———. 1929. Notes on North American fleas. Novitates Zoologicae 35:28-39, plates 1-2.

———. 1931*a*. Three new South American fleas. Novitates Zoologicae 36:311-316, Fig. 1-5.

———. 1931*b*. Further records and descriptions of fleas from Ecuador. Novitates Zoologicae 37:135-143, Fig. 1-12.

———. 1931*c*. Flöhe aus Venezuela. Zeitschrift fur Parasitenkunde 3(2):264-266, 1 Fig.

———. 1933. A survey of the classification of the American species of *Ceratophyllus s. lat.* Novitates Zoologicae 39:70-79.

———. 1936. Some Siphonaptera from South America. Novitates Zoologicae 39:305-310, Fig. 65-67.

———. 1938*a*. Where subspecies meet. Novitates Zoologicae 41:103-111, Fig. 48-53.

———. 1938*b*. On some neotropical Siphonaptera. Novitates Zoologicae 41:164-169, Fig. 108-114.

———. 1939. On *Rhopalopsyllus* Baker 1905 (Siphonaptera). Novitates Zoologicae 41:443-448, Fig. 323-332.

———. 1950. Notes on a collection of fleas from Peru. Bulletin of the World Health Organization 2(4):597-609 Fig. 1-5.

Jordan, K., and N. C. Rothschild. 1906. Notes on Siphonaptera from the Argentine described by the late Professor Dr. Weyenbergh. Novitates Zoologicae 13:170-177. 1 Fig.

———. 1908. Revision of the noncombed eyed Siphonaptera Parasitology 1:1-100, Plates 1-7.

———. 1911. Katalog der Siphonapteren des Königlichen Zoologischen Museum in Berlin. Novitates Zoologicae 18:57-89, Fig. 1-10.

———. 1914. Katalog der Siphonapteren des Königlichen Zoologischen Muesum in Berlin. Novitates Zoologicae 21:255-260, Fig. 1-2.

———. 1915. Contribution to our knowledge of American Siphonaptera. Ectoparasites 1(1):45-60, Fig. 48-64

———. 1920. On American bird Ceratophylli. Ectoparasites 1(2):65-76, Fig. 65-72.

———. 1921*a* A new species of Sarcopsyllidae. Ectoparasites 1(3):131-132. Fig. 105-106.

———. 1921*b*. New genera and species of bat-fleas. Ectoparasites 1(3):142-162, Fig. 116-147.

———. 1921*c*. Eight new *Ceratophylli*. Ectoparasites 1(3):163-177, Fig. 148-164.

———. 1922. New Siphonaptera. Ectoparasites 1(4): 266-283, Fig. 258-275.

———. 1923*a*. New American Siphonaptera. Ectoparasites 1(5):309-319. Fig. 312-327.

———. 1923*b*. On the genera *Rhopalopsyllus* and *Parapsyllus*. Ectoparasites 1(5):320-370, Fig. 328-383.

Linnaeus, C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species cum characteribus, differentiis, synonymis, locis. Editio* decima, reformata. Tomas I. Laurentii Salvii, Homaiae, 824 pages.

Macchiavello, A. 1948. Siphonaptera de la Costa Sur-Occidental de América (Primera Lista y Distribución Zoo-Geográfica). Boletín de la Oficina Sanitaria Panamericana Publicasion 237:1-49 (separate): or 27(5):412-460.

Machado-Allison, C. E. 1962*a*. Notas sobre Rhopalopsyllidae. I. Sobre algunas formas de *Polygenis* Jordan (Siphonaptera, Rhopalopsylloidea). Papéis Alvusos ao Departamento de Zoologia 15(3):23-27, Fig. 1-3.

———. 1962*b*. Notas sobre Rhopalopsyllidae. II. Consideraciones sobre la distribución y huéspedes de la tribu Rhopalopsyllini (Siphonaptera, Rhopalopsylloidea). Acta Biológica Venezuelica 3(12): 173-193.

———. 1963. Lista preliminar de los sifonápteros de Venezuela y consideraciones sobre algunas especies. Acta Biológica Venezuelica 3(16):269-278.

———. 1964. Nota previa sobre los Hystrichopsyllidae (Siphonaptera) de Venezuela. y descripción del macho de *Adoratopsylla* (*A.*) *dilecta* Jordan, 1938. Acta Biológica Venezuélica 4(4):157-167, Fig. 1-6.

———. 1966. Artrópodos de interés médico y veterinario. I. Pulgas (Siphonaptera) Cuadernos Cientificos, Direccion de Cultura, Universidad Central de Venezuela Caracas, 51. p.

Machado-Allison, C. E., and M. Tengler de McClure. 1963. Notas sobre Rhopalopsyllidae. III. Consideraciones sobre las subespecies de *Tiamastus* (*Gephyropsylla*) *klagesi* (Siphonaptera, Rhopalopsylloidea). Acta Biológica Venezuélica 3(27):421-436, Fig. 1-19.

Olliff, A. S. 1886. Description of a new Aphanipterous insect from new South Wales. Proceedings of the Linnean Society of New South Wales (2), 1 (1):171-172.

Osgood, W H 1912. Mammals from western Venezuela and eastern Colombia. Field Museum of Natural History. Zoology Series 10(5):33-66.

Patton, W. S., and A. M. Evans. 1929. Insects, ticks, mites and venomous animals of medical and veterinary importance. Liverpool School of Tropical Medicine, Part 1. Pages 1-786, Fig. 1-374.

Pinto, C. 1930. Arthrópodes parasitos e transmissores de doencas. Chapter 10, Siphonapteros. *In* Tratado de Parasitologica 4(1-2):281-395, Fig. 113-190. Pimento de Mello and Cia, Rio de Janiero.

Rothschild, N. C. 1903*a*. New species of Siphonaptera from Egypt and the Soudan. Entomologists Monthly Magazine 39:83-87, plates 1-2.

———. 1903*b*. Further contributions to the knowledge of the Siphonaptera. Novitates Zoologicae 10:317-325, plates 9-10.

———. 1904. Further contributions to the knowledge of the Siphonaptera. Novitates Zoologicae 11:602-653, plates 7-16.

———. 1909. Some additional notes on fleas dealt with in previous papers. Novitates Zoologicae 16: 332.

———. 1910. A synopsis of the fleas found on *Mus norvegicus*, *Mus rattus alexandrinus* and *Mus musculus*. Bulletin of Entomological Research 1:89-98, Fig. 1-28.

———. 1911. Some new genera and species of Siphonaptera. Novitates Zoologicae 18:117-122, Fig. 1-4.

———. 1914. New Siphonaptera from Peru. Novitates Zoologicae 21:239-251, Fig. 1-13.

———. 1915. A synopsis of the British Siphonaptera. Entomologists Monthly Magazine 51:56, 91, Plate 7, Fig. 4, 10.

Schoenherr, C. J. 1811. *Pulex segnis* ny Svensk species. Svenska vetenskaps akadamien Nay handlingar, Kongliga Series 2. 32:98-101.

Smit, F. G. A. M. 1953. Descriptions of new and little-known Siphonaptera. Bulletin of the British Museum (Natural History) Entomology 3(5): 187-219, Fig. 1-62.

———. 1954. New bat-fleas (Siphonaptera: Ischnopsyllidae). Parasitology 44(1-2):144-156, Fig. 1-32.

———. 1955. Siphonaptera from Bariloche, Argentina, collected by Dr. J. M. de la Barrera in 1952-1954. Transactions of the Royal Entomological Society, London 107:319-339, Fig. 1-24.

———. 1958. A preliminary note on the occurrence of *Pulex irritans* L. and *Pulex simulans* Baker in North America. Journal of Parasitology 44(5): 523-526, Fig. 1-2.

———. 1961. Siphonaptera from the Falkland Islands. The Entomologist 94(1174):66-69.

Smit, F. G. A. M., and L. M. Wright. 1965. Notes on the Wagner collection of Siphonaptera in the Zoologisches Museum, Hamburg. Mitteilungen aus dem Hamburgisehen zoologischen Museum und Institute Hamburg 62(1964):1-54, Fig. 1-16, plate 1.

Stiles, C. W., and B. I. Collins. 1930. *Ctenocephalides*, new genus of fleas, type *Pulex canis*. Public Health Reports 45(23):1308-1310.

Tipton, V. J. and E. Mendez 1966. The fleas (Siphonaptera) of Panama. In Ectoparasites of Panama, Field Museum of Natural History, Chicago. Pages 289-385, plates 47-93.

———. 1968. New species of fleas (Siphonaptera) from Cerro Potosi, Mexico, with notes on ecology and host parasite relationships. Pacific Insects 10(1):177-214, Fig. 1-46.

Traub, R. 1950. Siphonaptera from Central America and Mexico. A morphological study of the aedeagus, with descriptions of new genera and species. Fieldiana: Zoology Memoirs 1:127, plates 1-54.

———. 1952. Records and descriptions of fleas from Peru (Siphonaptera). Proceedings of the Entomological Society of Washington 54(1):1-22, Fig. 1-27.

Traub, R., and J. G. Gammons. 1950. Two new fleas of the family Tungidae. Journal of Parasitology 36(3):270-273. Fig. 1-7.

Traub, R., and P. T. Johnson. 1952. Fleas collected during a plague survey in Venezuela. Boletin de la Oficina Sanitaria Panamericana 32(2).111-135, Fig. 1-35.

Vogelsang, E. 1936. Contribución al estudio de la Parasitología animal in Venezuela. V. Ectoparásitos Revista de la Policlinica. Caracas VI(3):122.

———. 1939. Contribución al estudio de la Parasitología animal in Venezuela XI. Artrópodos ectoparásitos. Revista de Medicina Veterinária y Parasitología. Caracas 1(2-4):168-172.

———. 1948. Contribución al estudio de la Parasitología animal in Venezuela XVI. Ecto- y endoparásitos en animales domésticos y salva es en la Guayana Venezolana. Revista de Medicina Veterinária y Parasitología. Caracas VII (1-4):145-151

Wagner, J. 1901. Aphanipterologische studien. IV Beschreibung neuer arten der gattungen *Ceratophyllus*, *Pulex* und *Typhlopsylla*. Horae Societatis Entomologicae Rossicae 35:17-29, 1 plate.

———. 1930. Katalog der palaearktischen Aphanipteran Vienna, Fritz Wagner. 55 pages.